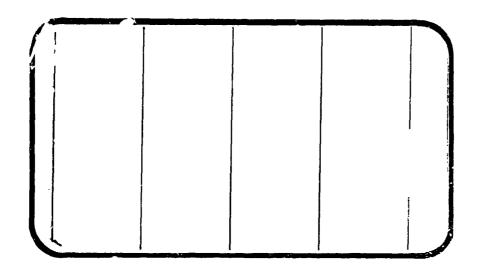


# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA CR-

141513



(NASA-CR-141513) RESULTS OF INVESTIGATION ON AN 0.004-SCALE 140C MODIFIED CONFIGURATION SPACE SHUTTLE VEHICLE ORBITER MODEL (74-0) IN THE NASA/LANGLEY RESEARCH CENTER HYPERSONIC NITROGEN TUNNEL (0A89)

N75-21344

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SPACE SHUTTLE

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AEROTHERMODYNAMIC DATA REPORT

JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA MANagement services



DMS-DR-2214 NASA CR-141,513

RESULTS OF INVESTIGATIONS ON AN 0.004-SCALE

140C MODIFIED CONFIGURATION SPACE SHUTTLE VEHICLE

ORBITER MODEL (74-0)

IN THE NASA/LANGLEY RESEARCH CENTER

HYPERSONIC NITROGEN TUNNEL (UA89)

Ву

P. J. Hawthorne Shuttle Aero Sciences Rockwell International Space Division

Prepared under NASA Contract Number NAS9-13247

Ву

Data Management Services Chrysler Corporation Space Division New Orleans, La. 70189

for

Engineering Analysis Division

Johnson Space Center National Aeronautics and Space Administration Houston, Texas

#### WIND TUNNEL TEST SPECIFICS:

Test Number:

HNT 30, 31

NASA Series Number: 0A89 Model Number:

74-0

Test Dates:

12 July through 6 August 1974 and

30 August through 5 September 1974

Occupancy Hours:

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Chrysler Corporation Space Division assumes no responsibility for the data presented other than display characteristics.

# RESULTS OF INVESTIGATIONS ON AN 0.004-SCALE 140C MODIFIED CONFIGURATION SPACE SHUTTLE VEHICLE ORBITER MODEL (74-0)

IN THE NASA/LANGLEY RESEARCH CENTER
HYPERSONIC NITROGEN TUNNEL (0A89)

Ву

P. J. Hawthorne, Rockwell International Space Division

#### **ABSTRACT**

This report documents data obtained during a wind tunnel test of an 0.004-scale 140C modified configuration SSV Orbiter in the NASA/Langley Research Center 22-inch Hypersonic Nitrogen Tunnel. The test was conducted during July, August and September 1974 and 136 occupancy hours were charged. All presented runs were conducted at a nominal Mach number of 19.8 and at a Reynolds number of approximately  $0.68 \times 10^6$  per foot.

The complete 140C modified model was tested with various elevon settings and additionally in wing off/bodyflap off configuration at angles of attack from -5 to 42.5 degrees at zero yaw.

Purpose of this test was to obtain high hypersonic longitudinal and lateral-directional stability and control characteristics of the updated SSV configuration in an initially diatomic medium.

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	FIGURE	4 E	5 O1	6 9	) EI	8 	6

PLOT SCHEDULE:

CN vs. ALPHA, CN vs CLM, CL vs. ALPHA, CL vs. CLM, CA, CLM, L/D, and CD vs. ALPHA **A** 

B) CY and CYN vs. ALPHA

## NOMENCLATURE General

SYMBOL	PLOT SYMBOL	DEFINITION
a		speed of sound; m/sec, ft/sec
$C_{\mathbf{p}}$	CP	pressure coefficient; $(p_1 - p_{\infty})/q$
M	MACH	Mach number; V/a
p		pressure; N/m <sup>2</sup> , psf
q	Q(NSM) Q(PSF)	dynamic pressure; $1/2\rho V^2$ , $N/m^2$ , psf
RN/L	RN/L,RN	Reynolds number; based on model length
V		velocity; m/sec, ft/sec
α	ALPHA	angle of attack, degrees
β	BETA	angle of sideslip, degrees
$\psi$	PSI	angle of yaw, degrees
$\phi$	PHI	angle of roll, degrees
ρ		mess density; $kg/m^3$ , $slugs/ft^3$
	Refe	rence & C.G. Definitions
Ab .		base area; m <sup>2</sup> , ft <sup>2</sup>
b	BREF	wing span or reference span; m, ft
c.g.		center of gravity
<b>ℓ</b> <sub>REF</sub> c	LREF	reference length or wing mean serodynamic chord; m, ft
S	SREF	wing area or reference area; m <sup>2</sup> , ft <sup>2</sup>
	MRP	moment reference point
	XMRP	moment reference point on X axis
	YMRP	moment reference point on Y axis
	ZMRP	moment reference point on Z axis
SUBSCRIPTS b 1 s t		base local static conditions total conditions free stream

## NOMENCLATURE (Continued)

## Body-Axis System

SYMBOL	PLOT SYMBOL	DEFINITION
$c_{N}$	CN	normal-force coefficient; normal force
C <sub>A</sub>	CA	axial-force coefficient; axial force qS
$\mathbf{c}_{\mathbf{Y}}$	CY	side-force coefficient; side force qS
$^{\mathrm{C}}_{\mathrm{A_b}}$	CAB	base-force coefficient; base force $-A_b(p_b-p_\varpi)/qS$
$^{\mathrm{C}}_{\mathbf{A_f}}$	CAF	forebody axial force coefficient, CA - CAb
c <sub>m</sub>	CIM	pitching-moment coefficient; pitching moment qs/REF
C <sub>n</sub>	CYN	yawing-moment coefficient; yawing moment qSb
с <b>/</b>	CBL	rolling-moment coefficient; rolling moment
		Stability-Axis System
$c^{\mathbf{r}}$	CL	lift coefficient; lift qS
$c_D$	CD	drag coefficient; drag
$c_{D_{\pmb{b}}}$	CDB	base-drag coefficient; base drag
$\mathbf{c}_{\mathbf{D_{f}}}$	CDF	forebody drag coefficient; $C_D - C_{D_b}$
$\mathbf{c}_{\mathbf{Y}}$	CY	side-force coefficient; side force qS
C <sub>m</sub>	CLM	pitching-moment coefficient; pitching moment qSf <sub>REF</sub>
$c_n$	CLN	yawing-moment coefficient; yawing moment qSb
<b>cℓ</b>	CSL	rolling-moment coefficient; rolling moment qSb
L/D	L/D	lift-to-drag ratio; C <sub>I</sub> /C <sub>D</sub>
L/Df	L/DF	lift to forebody drag ratio; $c_{\rm L}/c_{\rm D_{\rm f}}$

# NOMENCLATURE (Continued) Additional Nomenclature

Symbol	Plot Symbol	Definition
IML		inner mold line
MRC		moment reference center
OML		outer mold line
X <sub>cp</sub> / <sub>LB</sub>	XCP/L	longitudinal center of pressure location, fraction of body length
Xo		Orbiter longitudinal station, in.
Yo		Orbiter lateral station, in
Z <sub>o</sub>		Orbiter vertical station, in
aj		wing incidence angle, degrees
δBŁ	BDFLAP	bodyflap deflection angle, degrees
δR	RUDDER	rudder deflection angle, degrees
δSB	SPDBRK	speedbrake defiection angle, degrees
δ <sub>a</sub>	AILRON	aileron, total aileron deflection angle, degrees, (left aileron - right aileron)/2
δ <sub>e</sub>	ELEVTR	elevator surface deflection angle, positive deflection trailing edge down, degrees
	BALANC	parameter name to document balance utilized in testing, BALANC = 1 (LaRC HNO5), BALANC = 2 (LaRC HNO6), see Remarks section
	STING	parameter name for sting, sting parameter values of 25 and 45 denote a 25° and 45° sting used for testing, respectively

#### REMARKS

OA89 was conducted in three distinct portions, from July 12 throug

July 29, July 30 to August 6 and from August 30 through Server er 5, 1974.

During the first time period, the model was installed in the tunnel on the Langley Research Center HNO 6 component water cooled balance on a 45° bent sting. On July 24 it was found that the model was running slightly yawed, and this along with certain balance problems prompted re-running of the basic configuration plows to determine incremental effects of these problems. On July 29, the thermocouple indicating balance water temperature indicated 32°F during the afternoon run, and subsequent investigation revealed a broken bellows in the vater cooling line, and that ice had been forming in the balance due to evaporative cooling. A balance change was then made to the lower range HNO 5 component water cooled balance, still on the 45° bent sting.

From July 30 to August 6 selected runs were made with the HNO 5 instrument, and it was undertaken to rerun the test with an abbreviated run schedule due to time constraints on the 74-0 model utilization. The test article was then removed from the test section for use elsewhere; this entire entry is referred to by Langley Research Center as test HNT 30.

The second installation was made at the end of August to investigate suspected sting effects; this time the HNO 5 balance was used with a 25° bent sting. This is known as the HNT 31 test series. Base pressure data were taken with only one pressure tap during OA89, instead of the two shown in the pretest report. Data were collected at total pressures of 2200 and

## REMARKS (Concluded)

5000 psi during both HNT 30 and HNT 31, but the  $P_{T}$  = 2200 psi data is considered to be of questionable quality and only the  $P_{T}$  = 5000 psi data utilizing the HNO 5 balance is presented here, and none of the HNO 6 balance data are presented.

#### CONFIGURATIONS INVESTIGATED

During test OA89, the 140C modified vehicle was tested in full up and wing off configurations. The basic aircraft is of blended wing body design with a double delta wing, full span elevons and a single centerline vertical tail with rudder and/or speedbrake capability. A bodyflap and short pod orbital maneuvering system (OMS) were mounted on the aft fuselage bottom edge and upper sidewalls, respectively.

The following letter designations are used to denote the components of the -140C modified configurations:

B <sub>62</sub>	Fuselage to the outer mold line contours of drawings
02	VL70-000202B, -000200B & 000203 for the aft body contour
	(except OMS), the $12.70-0002028$ drawing was used in lieu of
	the C revision specified on the VL70-000140C control drawing
	since the C revis on was not available. The MPS nozzles are
	not simulated.

Canopy to	VL70-000202B	lines; se	e B <sub>62</sub> above.
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E <sub>43</sub>	Elevon used with VL70-000200B wing, with 6" gaps.	The hinge-
73	line is unswept and located at $X_0 = 1387$ .	•

F <sub>10</sub>	Center pivot bodyflap ninge line at $x_0 = 1532$ and planform as denoted on VL70-000200B drawing.
	as denoted on VL/U-UUUZUUB drawing.

M <sub>1.4</sub>	Baseline short nose Orbital Maneuvering System (OMS) pods
רו	mounted on the upper base of the fuselage. Shape is defined
	by drawing VL70-08457. Rocket engine nozzles are simulated.

R <sub>5</sub> Rudder utilized with V <sub>8</sub>	yertical tail	l and shown on VL70-000146A.
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٧ <sub>Q</sub>	45° sweep leading edge single centerline mounted vertical tail
U	of modified diamond section as per VL70-000146A.

W <sub>127</sub>	VL70-000200B wing. Wing is of 81°/45° sweep leading edge and
127	is 6 inches F.S. thicker at the body than -140A. Airfoil is
	RIC modified NASA 0011.3 at $Y_0 = 199$ , 0012-64 at theoretical
	tip. $\alpha_i = +0^\circ$ 30' dihedral = 3° 30' at TE., tip is defined by
	VL70-006092.

## CONFIGURATIONS INVESTIGATED (Concluded)

Component descriptor sheets are given in Table III.

The tested configurations were denoted as:

140C modified =  $B_{62}$   $C_{12}$   $E_{43}$   $F_{10}$   $M_{14}$   $R_5$   $V_8$   $W_{127}$ 

140C modified wing and body flap off =  $B_{62}$   $C_{12}$   $M_{14}$   $R_{5}$   $^{\prime\prime}$  .

#### TEST FACILITY DESCRIPTION

The NASA/Langley Research Center 18-inch Hypersonic Nitrogen Tunnel is a blow down facility with a normal operational time of up to two hours for force and moment testing. This long run time is possible because the nitrogen is obtained in liquid form, mechanically pumped to 17,000 psig  $P_T$ , and then vaporized and heated to 2900°F  $T_T$  prior to entry into the notice. The test section is of the open jet variety with a water cooled diffusor that exits into a 60-foot diameter vacuum sphere.

Models are sting mounted on an injectable blade strut with externally controllable pitch capability and manually setable yaw freedom. Force testing is done utilizing 5 component water cooled internal strain gauge balances, with injection time kept to a absolute minimum (less than 5 seconds) to alleviate balance drift problems due to aerodynamic heating. Air is also blown on the model to cool it while in the retracted position between injections.

Recent calibrations of the tunnel indicate that the most satisfactory conditions to obtain force data are:

Total pressure = 5000 psi

Total temp = 3360 °R

RN/foot = 0.68 x 10<sup>6</sup>

Mach = 19.80

The most recent operational parameters of the contoured nozzle are best obtained from the LaRC Hypersonic Analysis Section (Phone (804) 827-2483).

## TEST FACILITY DESCRIPTION (Concluded)

The tunnel is also equipped with an electron beam flow vizualization device which allows color photographs with depth of field to be made of the flow system, allowing interpretation of shock interactions and flow separation phenomena.

#### DATA REDUCTION

Those data presented were obtained with the LaRC HNO 5 internal strain gauge balance at one set of tunnel conditions only (refer to the Remarks section). Data were converted to standard NASA force and moment coefficients and are presented about a nominal moment reference center in both stability and body axis systems.

Additionally, the normal force center of pressure is presented as:

$$X_{CP}/\ell_B = \frac{X_{CC}}{\ell_B} - \frac{C_m(\bar{c})}{CN\ell_B}$$

where  $X_{CP}$  is the longitudinal distance from the inner mold line nose station ( $X_{O}$  = 238 inches full scale) to the center of pressure. XCG is the distance from inner mold line to the moment reference point (XCG = XMRP - 238 = 838.7 inches). The body length ( $\mathfrak{L}_{B}$ ) is 1290.3 inches.

The following reference dimensions were used to reduce the data to coefficient form:

$$Sref$$
 = 2690.0 ft<sup>2</sup>  
 $LREF = \overline{c}$  = 474.81 in.  
 $BREF = b$  = 936.68 in.  
 $XMRP$  = 1076.7 in.  $X_0$   
 $YMRP$  = 0.0 in.  $Y_0$   
 $ZMRP$  = 375.0 in.  $Z_0$ 

Trop A Assis	IABL		
TEST: 0A89			DATE : Jan., 1975
	TEST CON	DITIONS	
MACH NUMBER	REYNOLDS NUMBER	DYNAMIC PRESSURE	STAGNATION TEMPERATURE
	(per feet)	(psf)	(degrees Fahrenheit)
19.80	0.68 x 10 <sup>6</sup> /foot	40	2900°F
		······································	<u> </u>
		·	
BALANCE UTILIZED:	HNO 5		
	CAPACITY:	ACCURACY:	COEFFICIENT
			TOLERANCE:
NF	51 1bf	0.5%	
SF	3 1bf	0.5%	
AF	31 1bf	0.5%	
PM	5 in 1bf	0.5%	
RM	no flexure	O C.W.	
YM	3 in 1bf	0.5%	<del></del>
COMMENTS: PT 5	000 psi		
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UMBER C	81 0 0 0 0									,										4	701	-	AN = 2.5 3
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## TABLE III MODEL DIMENSIONAL DATA

MODEL COMPONENT : HODY - BAR		
GENERAL DESCRIPTION: Configuration 1	100 orbiter fuse	lage MCR 200-R <sub>4</sub>
Similar to 140A'B fuselage except aft be	ody revised and	improved
nidbody-wing-boot fairing X = 950 to X	, = 10 <u>4</u> 0.	
MUDEL SCALE: 0.004		
DRAWING NUMBER : <u>VL70-000140C00020</u> 000200B00020	2C -000205A 3	
DIMENSIONS .	FULL SCALE	MODEL SCALE
Length (OML: Fwd Sta. $X_0=235$ ) Length (IML: Fwd Sta. $X_{G}=238$ ).		5.173 5.161
Max. Width (@ $X_0 = 1528.3$ ) In.	264.0	1.056
Max Depth ( $@X = 1464$ ) In.	250_0	
Fineness Ratio (OML Length Max. Width) Area - Ft <sup>2</sup>	4. 899	4.899
Max. Cross—Sectional	340.885	0.0055
Planform	<del></del>	
Wetted		
Base		

MODEL COMPONENT : CANOPY - C12						
GENERAL DESCRIPTION: Configuration 1400 orbiter canopy vehicle						
cabin No. 31 updated to MCR 200-R. U-	cabin No. 31 updated to MCR 200-R. Used with fuselage B62.					
MODEL SCALE: 0.004						
DRAWING NUMBER :	D2B -000204					
DIMENSIONS:	FULL SCALE	MODEL SCALE				
Length $(X_0 = 1.31, .643 \text{ to } 578)$ In.	1/,3.357	0.573				
Max Width (@ $X_0 = 513.127$ ). In.	152.412	0.610				
Max Depth $(Z_0 = 501 \text{ to } 449.3^{\circ})$	In. 51.61	0.206				
Fineness Ratio						
Area						
Max. Cross—Sectional	****					
Planform	***************************************					
Wetted						
Base						

MODEL COMPONENT: ELEVON - E43							
GENERAL DESCRIPTION: Configuration 140A'B orbitor elevons.							
DATA are for one side, used on 74-0 model wi	th Wigg. Equis 6	"F.S. straight					
slotted gap version of Eq., gaps are at slev	on body flare junc	ture and at					
$Y_0 = 311.0$ MODEL SCALE: 0.	004						
DRAWING NUMBER: VL70- 000200, -00 R80006 Lockheed		o., Hunts <b>v</b> ille, <b>Ala</b> .					
DIMENSIONS:	FULL-SCALE	MODEL SCALE					
Area - Ft <sup>2</sup>	210.0	0.003					
Span (equivalent), In.	349.2	1.397					
Inb'd equivalent chord In.	118.004	0.472					
Outb'd equivalent chord, In.	_55.192	0.221					
Ratio movable surface chord/ total surface chord							
At Inb'd equiv. chord	0.2096	0.2096					
At Outb'd equiv. chord	0.4004	0.4004					
Sweep Back Angles, degrees	_						
Leading Edge	0.00	0.00					
Tailing Edge	- 10.056	-10.056					
Hingeline (Product of area & c) 3	0.00	<u>0.06</u>					
Area Moment ( ) Ft 3	1587.25						
Mean Aerodynamic Chord, In.	90.7	0.363					

MODEL COMPONENT : BODY FLAP - F10	<u> </u>	
GENERAL DESCRIPTION: Configuration	140C body flap.	Hingeline locate
at $X_0 = 1532$ , $Z_0 = 287$ .		
		•
MODEL SCALE: 0.004		
DRAWING NUMBER:VI.70-000140CVL70-	-355114	
DIMENSIONS :	FULL SCALE	MODEL SCALE
Length ( $X_0 = 1525.5 \text{ to } 1613$ ) In.	<u> </u>	0.350
Max Width (@ L.E., $X_0 = 1525.5$ )	In. 254.00	1.02/
Max Depth ( $X_0 = 1532$ ). In.	19.798	0.792
Fineness Ratio		-
Area - Ft <sup>2</sup>		
Max. Cross-Sectional (@ H. L	.) 35.196	0.00056
Planform	135.00	0.0022
Wetted	•	·
Base (@ $X_0 = 1613$ )	4.89	0.000078

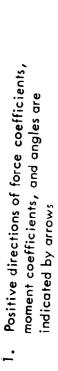
MODEL COMPONENT : OMS POD - M14		
GENERAL DESCRIPTION : Preliminary	IML version of sh	ort OMS pod.
(First used on 0.015 scale Model 36-0	) for test No. OA	83).
MODEL SCALE: OOL		
DRAWING NUMBER: VL70-008457		
DIMENSIONS: (For 1 of 2 sides)	FULL SCALE	MODEL SCALE
Length (OMS Fwd Sta X =1311), 1	In. <u>254.0</u>	1.036
Max Width (@ $X_0 = 1511$ ) In.	_135.6	0.5424
Max Depth (@ $X_0 = 1511$ ) In.	73.6	0.2944
Fineness Ratio	2.54080	2.54080
Area - Ft2		
Max. Cross-Sectional	54.507	0.00087
Planform		
Wetted		
Base		

MODEL COMPONENT:	/ERTICAL - V g		
GENERAL DESCRIPTION		rbiter vertical tai	l (identical
to continuration 14	OA'B vertical tail).		
MODEL SCALE: 0.	004		
DRAWING NUMBER: V	L70-000140C -000144B		
DIMENSIONS:		FULL SCALE	MODEL SCALE
TOTAL DATA			
Leading Trailir 0.25 El Chords:	on - In.  oper  Angles, Is a second age Edge  de Edge  dement Line	413.253 315.72 1.675 0.507 0.404 45.000 26.2 41.13	0,0068 1,263 1,675 0,507 0,404 45,000 26,2 41,13
Tip (Th M.C Fus. St W.P. of	Theo) MP neo) MP Ma. of .25 MAC 25 MAC 25 MAC	268.50 108.47 199.81 1463.35 635.52 0.0	1.07/ <sub>4</sub> 0.43/ <sub>4</sub> 0.799 5.853 2.542 0.0
Trailin	etion ; Wedge Angle - Deg. g Wedge Angle - Deg. ; Edge Radius	10,000 14,92 2,00	10,000 14,92 0,008
Void Area		13.17	0.00021
Blanketed A	rea	0.0	0.0

MODEL COMPONENT: RUDDER - R5		
GENERAL DESCRIPTION: Configuration 1400 ( Configuration 140A 'B rudder).	orbiter rudder (ide	ntical to
MODEL SCALE: 0.004		
DRAWING NUMBER: VL70-000146B -	000095	
DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area - Ft <sup>2</sup>	100.15	0.0016
Span (equivalent) . In.	201.00	0.804
Inb'd equivalent chord . In,	91.585	0.366
Outb'd equivalent chord In.	50.833	0.203
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.400	0.400
At Outb'd equiv. chord	0.400	0,400
Sweep Back Angles, degrees		
Leading Edge	34.83	34.83
Tailing Edge	26.25	26.25
Hingeline (Product of Area & c)	34.83	34.83
	Ft. 610.92	0.000039
Mean Aerodvnamic Chord In.	73.2	0.293

TABLE III. (Concluded)

### TOTAL DATA   Area (leo.)   Ft2	MODEL COMPONENT: WING-W127	**************************************	
MODEL SCALE: 0,00%   DMG. NO. VL70-00014 VC0002	PENERA_ DESCRIPTION: Configuration 1400 orbit	er wing. MCR 200-R,	⊂imilar to
MODEL SCALE: 0.00/.   DMG. NO. VL70-C0014 NC0002	140A'B wind W116 but with refinements:	improved wing-boot-	midbody fairing
### DMG. NO., VL70-C0014, PC., -0002  ### DMGNS:  ### TOTAL DATA Area (Tieo.) Ft2	$(.X_{\circ} = 940 \text{ to } X_{\circ} = 1040).$		
### MIMENSIONS: FULL-SCALE DEL SCALE  **TOTAL DATA** Area (eo.) Ft2** **Planform** Span (Theo In.	MODEL SCALE: 0.00%		
TOTAL DATA Area (Tieo.) Ft2  Planform Span (Treo In. 936.68 3.747 Aspect Ratio 2.265 2.265 Rate of Taper 1.177 1.177 Taper Ratio 0.200 0.200 Dinedral Angle, degrees 3.500 3.500 Incidence Angle, degrees 0.500 0.500 Aerodynamic Twist, degrees 3.000 3.000 Sweep Back Angles, degrees 3.000 3.000 Sweep Back Angles, degrees 3.000 3.000 Trailing Edge 7.0.56 7.0.56 7.0.56 0.25 Element Line 7.25 MAC 1.178.8 0.551 MAC 6.25 MAC 1.136.83 1.597 M.P. of .25 MAC 1.136.83 1.597 M.P. of .25 MAC 1.136.83 1.597 M.P. of .25 MAC 1.136.83 1.597 MAC 1.160) Ft2 Span, (Theo) In. BP108 7.0.68 2.883 Root BP108 7.19 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1	TEST NO.	DWG. NO. VL7	0-0001470, -00020
Area (neo.) Ft <sup>2</sup>	DIMENSIONS:	FULL-SCALE	JUDEL SCALE
Stanform   Span (Theo In.   Stanform   Span (Theo In.   Stanform   Span (Theo In.   Stanform   St			
Span (Theo In, Aspect Ratio   2.265   2.266   2.265		0/00 00	
Aspect Ratio Rate of Taper Rate of Taper Rate of Taper Ratio  O.200  Dinedral Angle, degrees  Incidence Angle, degrees Aerodynamic Twist, degrees  Aerodynamic Twist, degrees  Leading Edge Trailing Edge O.25 Element Line Chords:  Root (Theo, B.P.O.O. Tip, (Theo) B.P. MAC Fus. Sta. of .25 MAC B.L. of .25 MAC Span, (Theo) In. BP108  Aspect Ratio  Root BP108  Riph BP108  Root BP108  Riph BP108  Root BP1			
Rate of Taper Taper Ratio Dihedral Angle, degrees Incidence Angle, degrees Aerodynamic Twist, degrees Sweep Back Angles, degrees Leading Edge Trailing Edge O.25 Element Line Tip, (Theo) B.P. W.P. of .25 MAC B.L. of .25 MAC Span, (Theo) In. BP108 Aspect Ratio Chords Root BP108 Aspect Ratio Chords Root BP108 Aspect Ratio Chords Aspec			
Taper Ratio Dinedral Angle, degrees Incidence Angle, degrees Incidence Angle, degrees Aerodynamic Twist, degrees Sweep Back Angles, degrees Leading Edge Trailing Edge O,25 Element Line Chords: Root (Theo, B.P.O.O. Fis. Sta. of .25 MAC W.P. of .25 MAC B.L. of .25 MAC Area (Theo) Span, (Theo) In. BP108 Aspect Ratio Chords Root BP108 Tip 1.00 b MAC Root BP108 Tip 1.00 b MAC Root BP108 Tip 1.00 c MAC Area (Theo) Root BP108 Tip 1.00 b MAC Area (Theo) Root BP108 Tip 1.00 b MAC Area (Theo) Sta. of .25 MAC Area (Theo) Chords Root BP108 Tip 1.00 b MAC Area (Theo) Sta. of .25 MAC Area (Theo) Chords Root BP108 Tip 1.00 b Tip 1.00 c To 1.00 c			
Dihedral Angle, degrees Incidence Angle, degrees Aerodynamic Twist, degrees Sweep Back Angles, degrees Leading Edge Trailing Edge 0.25 Element Line Chords: Root (Theo, B.P.O.O. Tip, (Theo) B.P. MAC Fus. Sta. of .25 MAC B.L. of .25 MAC B.L. of .25 MAC Span, (Theo) In. BP108 Aspect Ratio Chords Root BP108 Tip 1.00 b Tip 1.00 b B.L. of .25 MAC B.L. of .25 MAC B.L. of .25 MAC Chords Root BP108 Tip 1.00 b Tip 1.00 b B.L. of .25 MAC B.L. of .25 MAC B.L. of .25 MAC Chords Root BP108 Tip 1.00 b Tip 1.00 c Tip		0.200	the same of the sa
Aerodynamic Twist, degrees  Sweep Back Angles, degrees  Leading Edge  Trailing Edge  0,25 Element Line  Chords:  Root (Theo, B.P.0.0.  Tip, (Theo) B.P.  MAC  Fus. Sta. of .25 MAC  B.L. of .25 MAC  Span, (Theo) In. BP108  Aspect Ratio  Chords  Root BP108  Tip 1.00 b  Fus. Sta. of .25 MAC  B.L. of .25 MAC  Area (Theo) In. BP108  Aspect Ratio  Chords  Root BP108  Tip 1.00 b  Span, (Theo) BP108  Tip 1.00 b  Area (Theo) Sta. of .25 MAC  B.L. of .25 MAC  B.L. of .25 MAC  Area (Theo) In. BP108  Tip 1.00 b  Taper Ratio  Chords  Root BP108  Tip 1.00 b  Area (Theo) Sta. of .25 MAC  B.L. of .25 MAC  B.L. of .25 MAC  B.L. of .25 MAC  Area (Theo) Sta. of .25 MAC  Area (Theo) In. BP108  Tip 1.00 b  Tip 1.00 c  Tip 1.00		<b>3.</b> 500	
Sweep Back Angles, degrees Leading Edge Trailing Edge 0.25 Element Line 0.25 Element Line Root (Theo, B.P.O.O. Tip, (Theo) B.P. MAC Fus. Sta. of .25 MAC B.L. of .25 MAC Span, (Theo) In. BP108 Aspect Ratio Root BP108 Root BP108 Tip 1.00 b MAC Fus. Sta. of .25 MAC Root B.L. of .25 MAC Root BP108 Tip 1.00 b MAC Fus. Sta. of .25 MAC Root BP108 Tip 1.00 b MAC Fus. Sta. of .25 MAC Root BP108 Tip 1.00 b MAC Fus. Sta. of .25 MAC M.P. of .25 MAC Root BP108 Tip 1.00 b MAC Fus. Sta. of .25 MAC M.P. o			
Leading Edge		3.000	3.000
Trailing Edge		31 000	15 000
0.25 Element Line Chords: Root (Theo, B.P.O.O. Tib, (Theo) B.P. MAC FUS. Sta. of .25 MAC B.L. of .25 MAC Span, (Theo) In. BP108 Aspect Ratio Chords Root BP108 Tip 1.00 b Tip 1.00 b AMAC Root BP108 Tip 1.00 b AMAC Airfoil Section (Rockwell Mod NASA)  M.P. of .25 MAC B.L. of .25 MAC Airfoil Section (Rockwell Mod NASA)  XXXX-64 Root b Planform Area Leading Edge Intersects Fus M. L. 6 Sta 1024.00 137.85 10.0018 10.	Trailing Edge		
Chords: Root (Theo) B.P.O.O. Tib, (Theo) B.P. B.P. Tib, (Theo) Theology and the second and the secon	0.25 Flement line		
Tip, (Theo) B.P.  MAC  Fus. Sta. of .25 MAC  B.L. of .25 MAC  Span, (Theo) In. BP108  Aspect Ratio  Taper Ratio  Chords  Root BP108  Tip 1.00 b  Tip 1.00 c  Tip 1.00 c  B.L. of .25 MAC  Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b  Tip b  Tip b  Tip b  Tip b  Tip b  Tip c  T			
Tip, (Theo) B.P.  MAC  Fus. Sta. of .25 MAC  B.L. of .25 MAC  Span, (Theo) In. BP108  Aspect Ratio  Taper Ratio  Chords  Root BP108  Tip 1.00 b  Tip 1.00 c  Tip 1.00 c  B.L. of .25 MAC  Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b  Tip b  Tip b  Tip b  Tip b  Tip b  Tip c  T	Root (Theo, B.P.O.O.	689.24	2.757
Fus. Sta. of .25 MAC  W.P. of .25 MAC  W.P. of .25 MAC  B.L. of .25 MAC  B.L. of .25 MAC  B.L. of .25 MAC  EXPOSED DATA  Area (Theo) Ft <sup>2</sup> Span, (Theo) In. BP108  Aspect Ratio  Chords  Root BP108  Tip 1.00 b  MAC  Fus. Sta. of .25 MAC  W.P. of .25 MAC  Area (Theo) Fus. Sta. of .25 MAC  Alifoil Section (Rockwell Mod NASA)  XXXXX-64  Root b  Tip b  Control  Root (1) of (2) Sides  Leading Edge Cuff Planform Area ct  Leading Edge Intersects Fus M. L. 0 Sta 500.00  Leading Edge Intersects Wing 0 Sta  10.124, 20.00  1136.83  1.547  1.007  1.007  1.007  1.007  1.007  1.007  1.007  1.00018  1.0000  1.00018  1.0000  1.00018  1.0000  1.00018  1.0000  1.0000  1.00000  1.00000  1.00000  1.00000  1.00000000	Tip, (Theo) B.P.		
W.P. of .25 MAC   290.58   1.162   0.729	7 <del>- 1 - 1</del>		
EXPOSED DATA  Area (Theo) Ft 2 1751.50 7.006 Span, (Theo) In. BP108 720.68 2.883 Aspect Ratio 2.059 2.059 Taper Ratio 0.245 0.245 Chords Root BP108 562.09 2.248 Tip 1.00 b 137.85 0.551  MAC 392.83 1.531 Fus. Sta. of .25 MAC 1185.98 4.744 W.P. of .25 MAC 294.30 1.172 B.L. of .25 MAC 294.30 1.172 B.L. of .25 MAC 251.77 1.007  Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b 2 0.113 0.113  Tip b = 0.120 0.120  Data for (1) of (2) Sides Leading Edge Cuff Planform Area 5t2 Leading Edge Intersects Fus M. L. 0 Sta 500.00 2.000 Leading Edge Intersects Wing @ Sta 1024.00 4.096		1136.83	4.547
EXPOSED DATA   Area (Theo) Ft2   1751.50   7.006     Span, (Theo) In. BP108   720.68   2.883     Aspect Ratio   2.059   2.059     Taper Ratio   0.245   0.245     Chords   562.09   2.248     Tip 1.00 b   137.85   0.551     MAC   392.83   1.531     Fus. Sta. of .25 MAC   1185.98   4.744     W.P. of .25 MAC   294.30   1.172     B.L. of .25 MAC   294.30   1.172     B.L. of .25 MAC   251.77   1.007     Airfoil Section (Rockwell Mod NASA)   XXXX-64     Root b =			
Area (Theo) Ft	•	182.13	_0.729
Span, (Theo)   In. BP108   720.68   2.883     Aspect Ratio   2.059   2.059     Taper Ratio   0.245   0.245     Chords   719 1.00 b   137.85   0.551     MAC   392.83   1.531     Fus. Sta. of .25 MAC   1185.98   4.744     W.P. of .25 MAC   294.30   1.172     B.L. of .25 MAC   251.77   1.007     Airfoil Section (Rockwell Mod NASA)   XXXX-64     Root b =			
Aspect Ratio Taper Ratio Chords  Root BP108 Tip 1.00 b Tip 1.00 c			
Taper Ratio Chords  Root BP108 Tip 1.00 b Tip 1.00 b  MAC  Sta. of .25 MAC W.P. of .25 MAC B.L. of .25 MAC Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b  Tip b =  O.245  O.245  O.245  O.245  O.245  O.245  O.245  O.250  O.551  A17.85 O.551  O.551  A185.98 A.744 A.			
Root BP108   562.09   2.248   Tip 1.00 b   137.85   0.551   MAC   392.83   1.531   Fus. Sta. of .25 MAC   1185.98   4.744   M.P. of .25 MAC   294.30   1.172   B.L. of .25 MAC   251.77   1.007   Airfoil Section (Rockwell Mod NASA)   XXXX-64   Root b =			
Root BP108 Tip 1.00 b  MAC  AC  Tip 1.00 b  MAC  Tip 1.00 b  MAC  Tip 1.00 b  MAC  392.83  1.531  Fus. Sta. of .25 MAC  W.P. of .25 MAC  B.L. of .25 MAC  Airfoil Section (Rockwell Mod KASA)  XXXX-64  Root b  Tip b =   O.113  O.113  O.120  Data for (1) of (2) Sides  Leading Edge Cuff Planform Area Ct2  Leading Edge Intersects Fus M. L. 0 Sta 500.00  Leading Edge Intersects Wing 0 Sta 1024.00  Loop6	· · · · · · · · · · · · · · · · · · ·	0.2/45	0.245
Tip 1.00 b  MAC  MAC  Fus. Sta. of .25 MAC  W.P. of .25 MAC  B.L. of .25 MAC  Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b = 0.113 0.113  Tip b = 0.120 0.120  Data for (1) of (2) Sides  Leading Edge Cuff Planform Area st2  Leading Edge Intersects Fus M. L. 6 Sta 500.00 2.000  Leading Edge Intersects Wing 6 Sta 1024.00 4.096		562.09	2.21.8
MAC Fus. Sta. of .25 MAC W.P. of .25 MAC W.P. of .25 MAC B.L. of .25 MAC Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b = 0.113  Tip b = 0.120  Data for (1) of (2) Sides Leading Edge Cuff Planform Area St2 Leading Edge Intersects Fus M. L. 6 Sta 500.00 Leading Edge Intersects Wing 6 Sta 1024.00  Loop6		137.85	0.551
Fus. Sta. of .25 MAC W.P. of .25 MAC B.L. of .25 MAC Airfoil Section (Rockwell Mod KASA)  XXXX-64  Root b = 0.113 0.113  Tip b = 0.120 0.120  Data for (1) of (2) Sides Leading Edge Cuff Planform Area st Leading Edge Intersects Fus M. L. 6 Sta 500.00 2.000 Leading Edge Intersects Wing 6 Sta 1024.00 4.096	· 5		
W.P. of .25 MAC  B.L. of .25 MAC  Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b = 0.113 0.113  Tip b = 0.120 0.120  Data for (1) of (2) Sides  Leading Edge Cuff Planform Area st2  Leading Edge Intersects Fus M. L. 8 Sta 500.00 2.000  Leading Edge Intersects Wing 8 Sta 1024.00 4.096			
B.L. of .25 MAC Airfoil Section (Rockwell Mod NASA)  XXXX-64  Root b = 0.113 0.113  Tip b = 0.120 0.120  Data for (1) of (2) Sides Leading Edge Cuff Planform Area st2 Leading Edge Intersects Fus M. L. 0 Sta 500.00 2.000 Leading Edge Intersects Wing 0 Sta 1024.00 4.096			
Airfoil Section (Rockwell Mod K4S/I) $ \begin{array}{cccccccccccccccccccccccccccccccccc$			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			
Root $\frac{b}{2}$ Tip $\frac{b}{2}$ O.113  O.113  O.120  O.120			
Data for (1) of (2) Sides  Leading Edge Cuff Planform Area Et2  Leading Edge Intersects Fus M. L. 8 Sta 500.00 2.000  Leading Edge Intersects Wing & Sta 1024.00 4.096	· · · · · · · · · · · · · · · · · · ·	0.'113	0.113
Leading Edge Cuff Planform Area Et2 Leading Edge Intersects Fus M. L. 0 Sta 500.00 2.000 Leading Edge Intersects Wing @ Sta 1024.00 4.096	Tip <u>b</u> -	0.120	0.120
Leading Edge Cuff Planform Area Et2 Leading Edge Intersects Fus M. L. 0 Sta 500.00 2.000 Leading Edge Intersects Wing @ Sta 1024.00 4.096	Data for (1) of (2) Sides		
Planform Area Str. 0.0018 Leading Edge Intersects Fus M. L. 0 Sta 500.00 2.000 Leading Edge Intersects Wing 0 Sta 1024.00 4.096	Leading Edge Cuff ,		
Leading Edge Intersects Fus M. L. 0 Sta 500.00 2.000 Leading Edge Intersects Wing 0 Sta 1024.00 4.096	Planform Area Stf		0.0018
Leading Edge Intersects Wing @ Sta 1024.00 4.096			
		1024.00	
23	23		



 For clarity, origins of wind and stability axes have beer displaced from the center of gravity

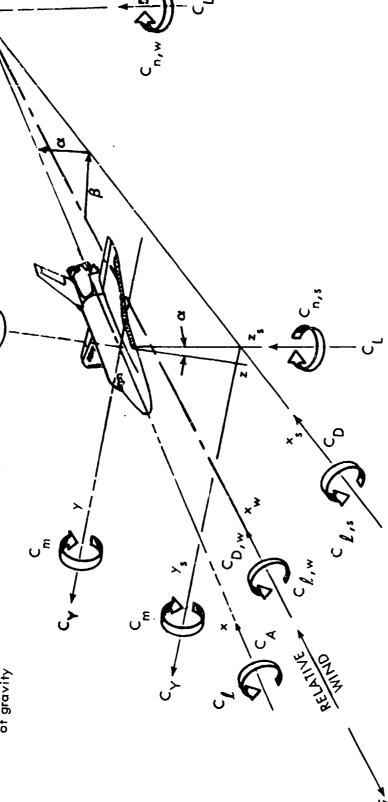


Figure 1. - Axis systems.

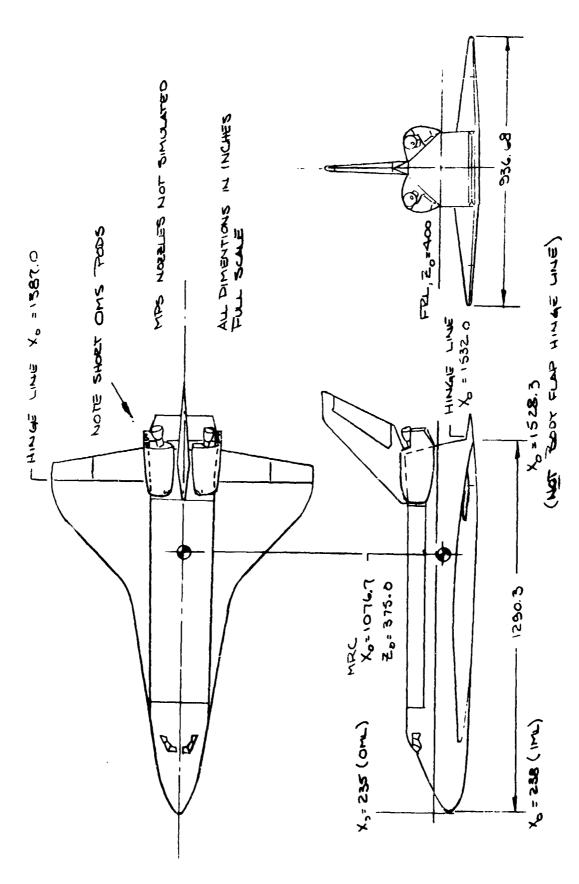
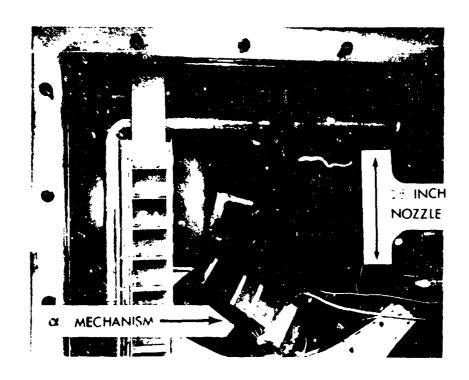


Figure 2. - 140C modified Orbiter for test 0A89



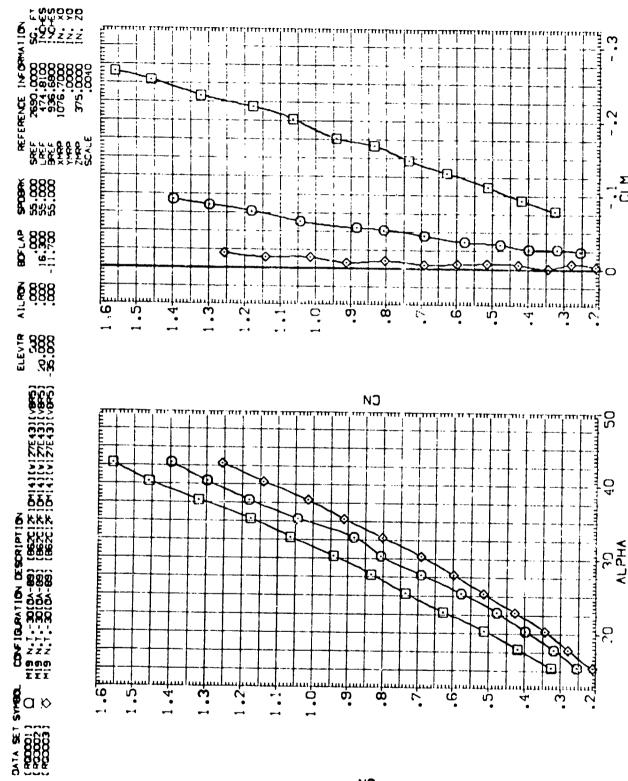
a. Test Section with Model Injected, 45° Bent Sting



b. 74-0 Model on 45° Sting

Figure 3. - Model photographs.

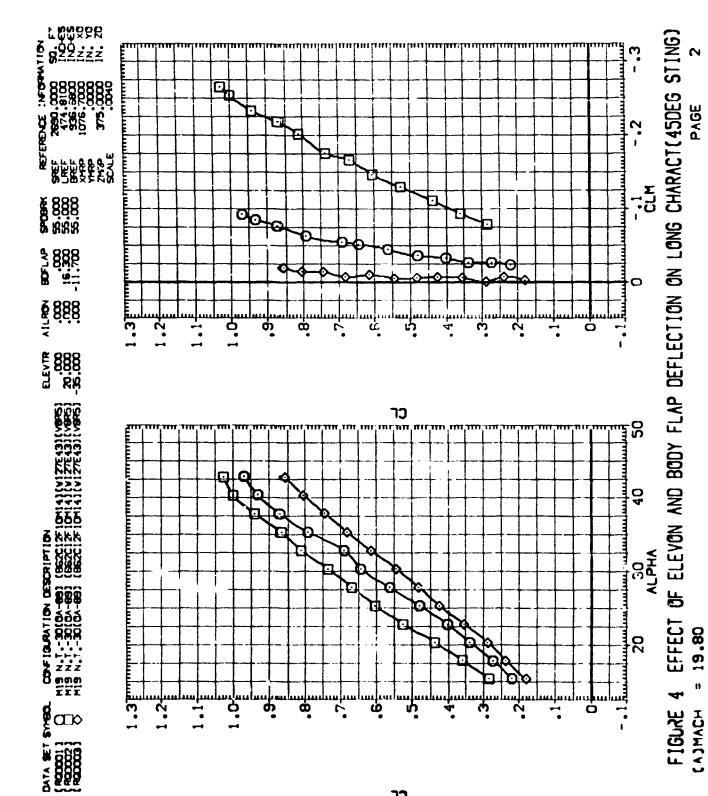
DATA FIGURES



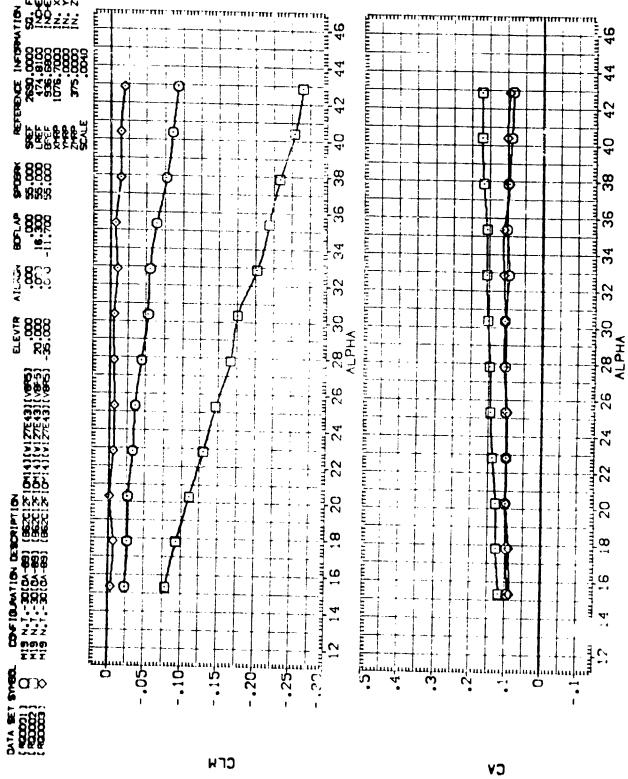
ELEVON AND BODY FLAP DEFLECTION ON LONG CHARACT(45DEG STING) 9 EFFECT .9.80 F I GURE

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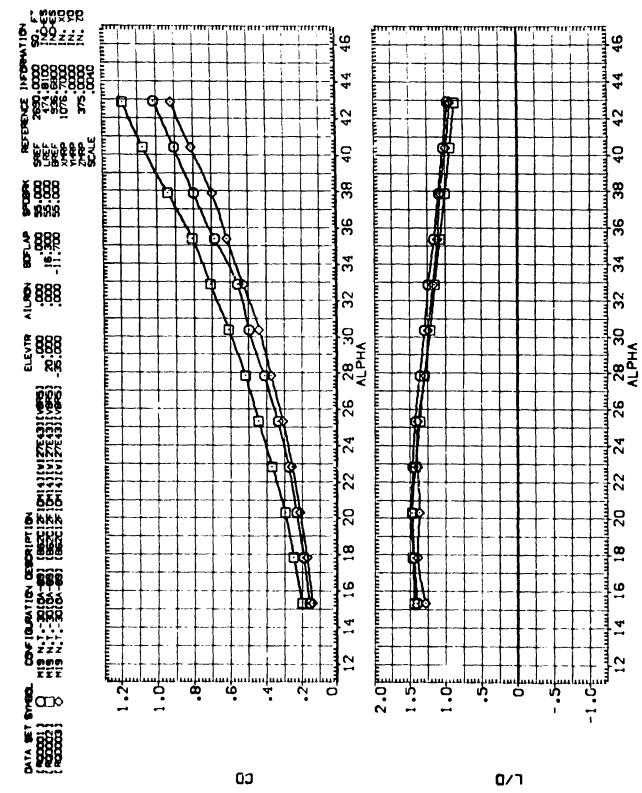


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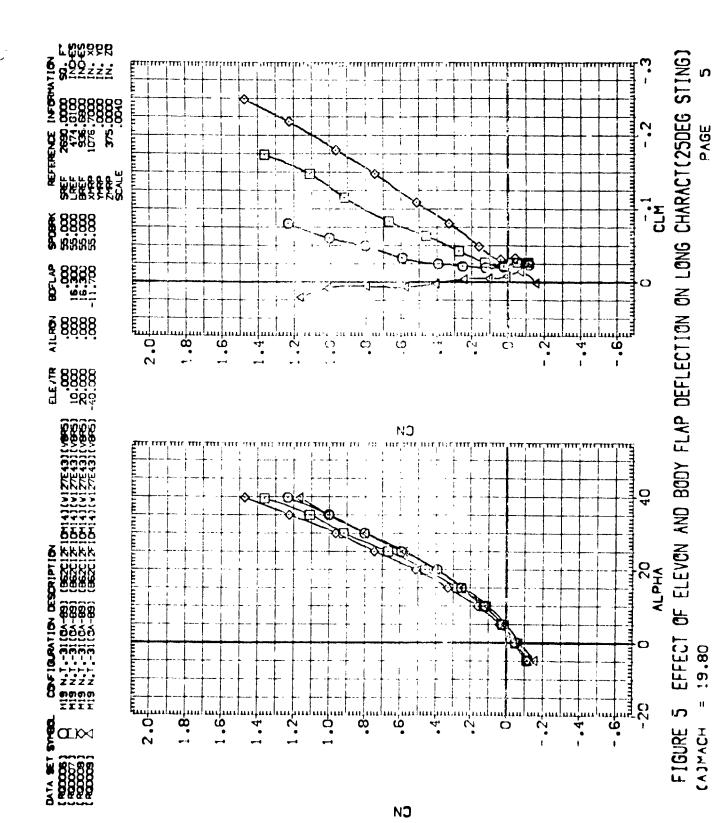


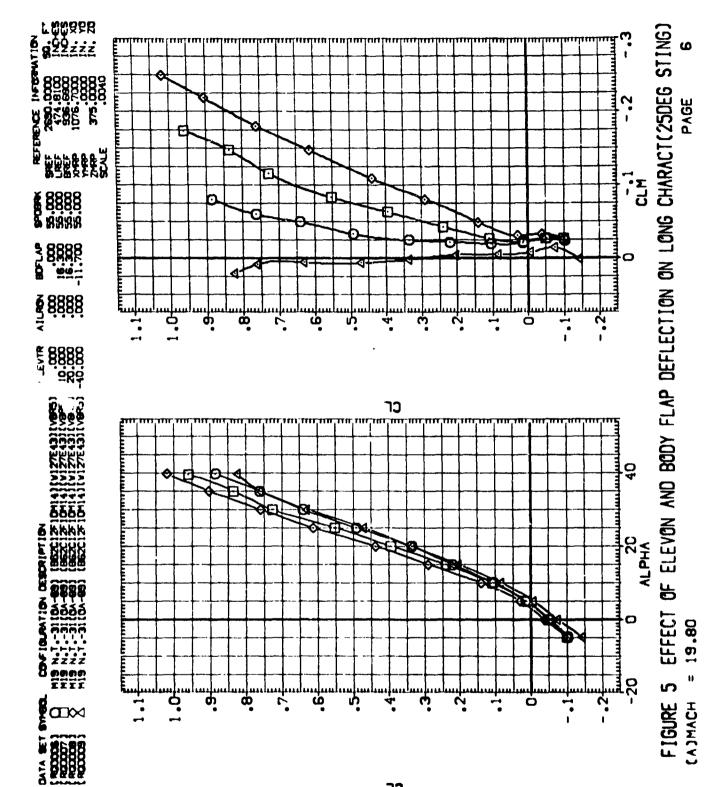
ELEVON AND BODY FLAP DEFLECTION ON LONG CHARACT(45DEG STING) EFFECT OF 1 FIGURE CA3~ACH

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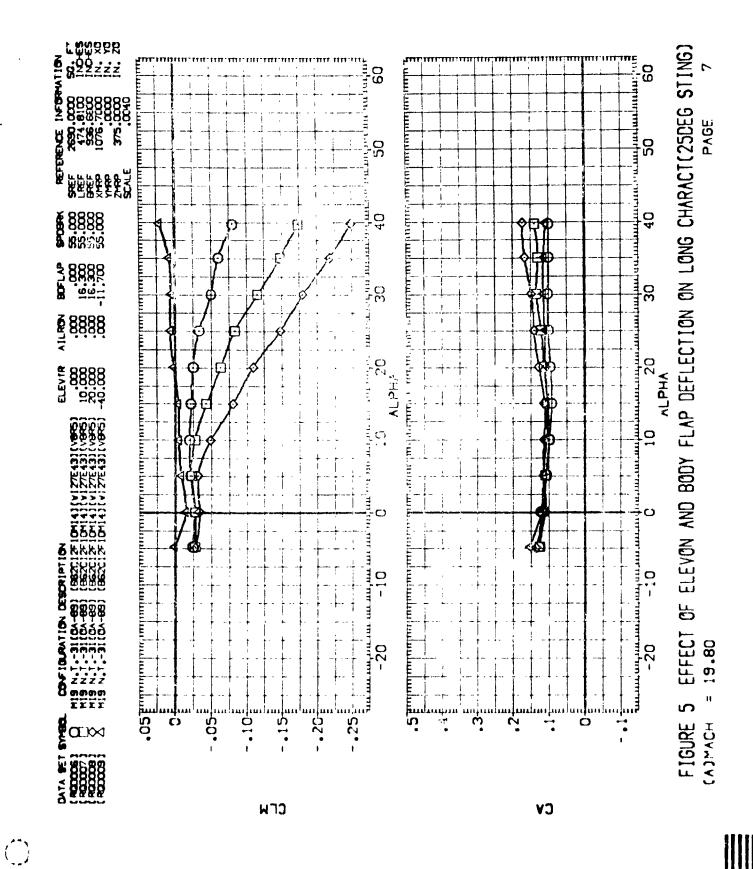


EFFECT OF ELEVON AND BODY FLAP DEFLECTION ON LONG CHARACT(45DEG STING) = 19.80 F16URE CAJMACH





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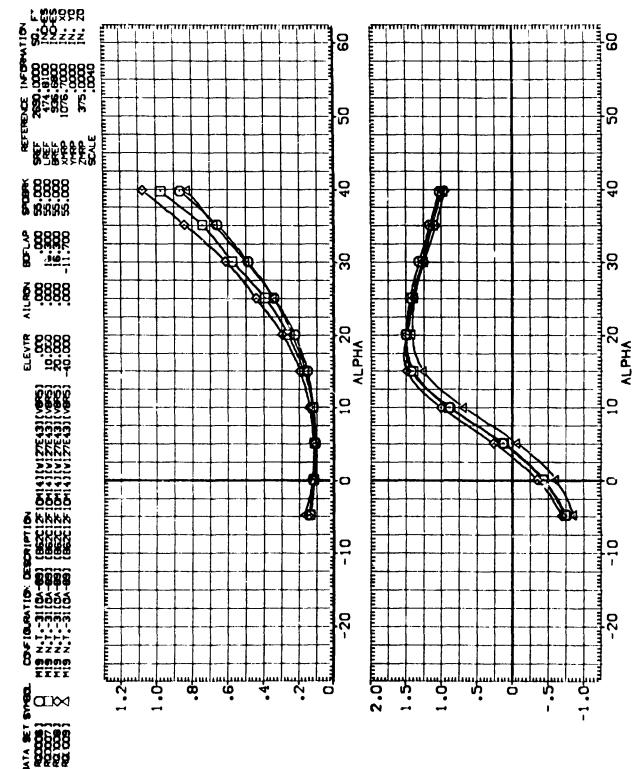
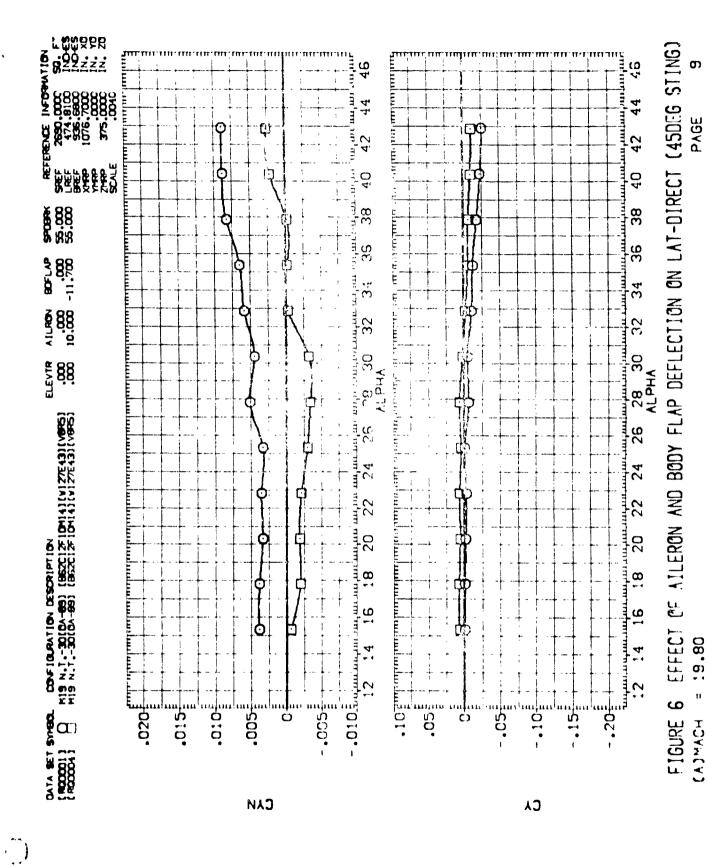


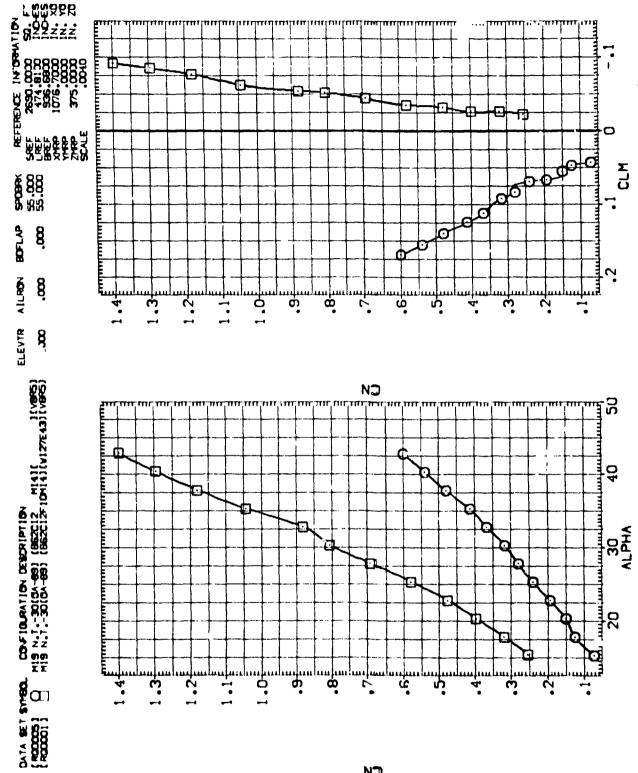
FIGURE 5 EFFECT OF ELEVON AND BODY FLAP DEFLECTION ON LANG CHARACT(25DEG STING) CADMACH = 19.80 PAGE 8

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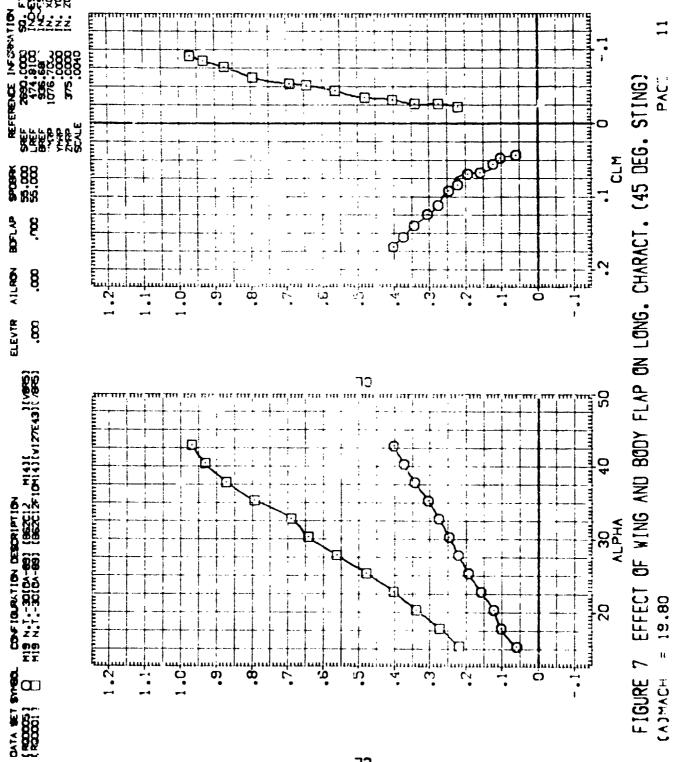


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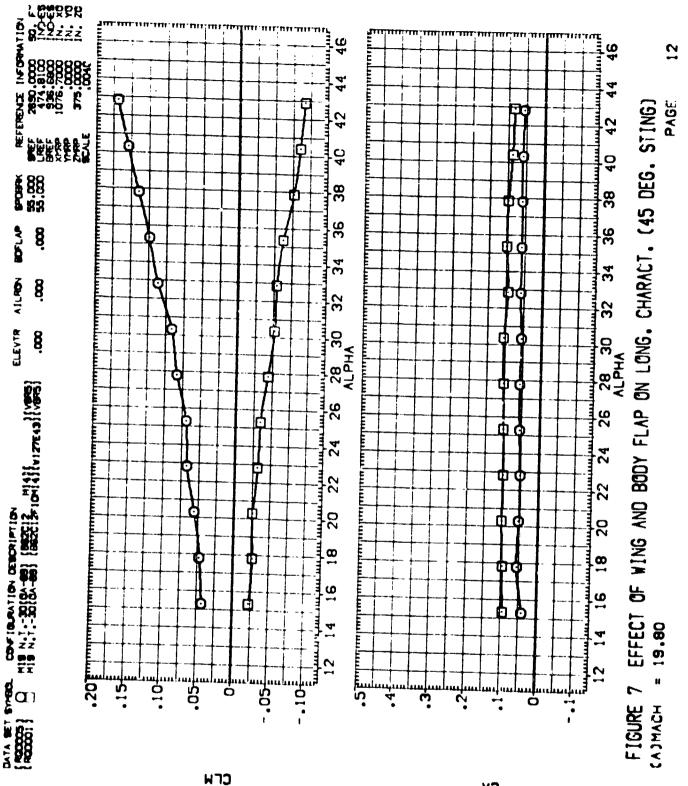


PAGE OF WING AND BODY FLAF ON LONG. CHARACT. (45 DEG. STING) EFFECT 19.80 FIGURE 7

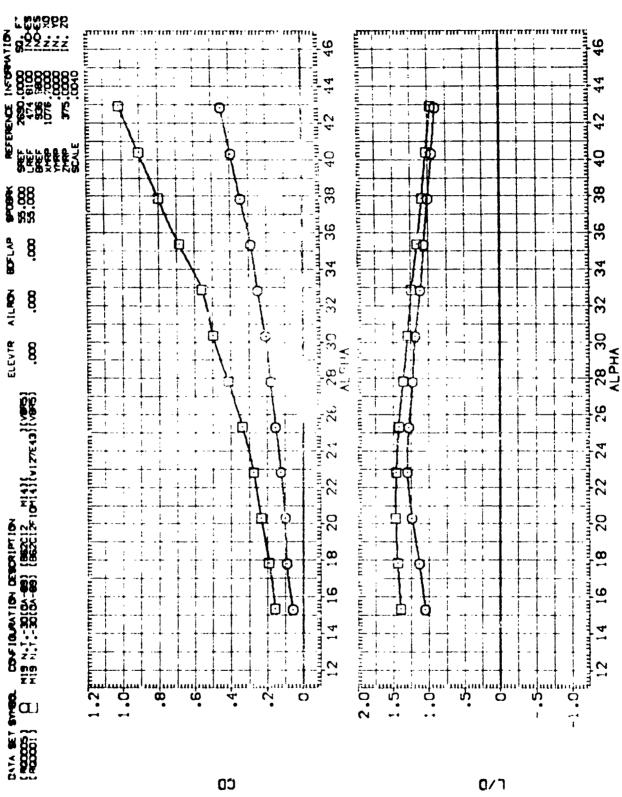
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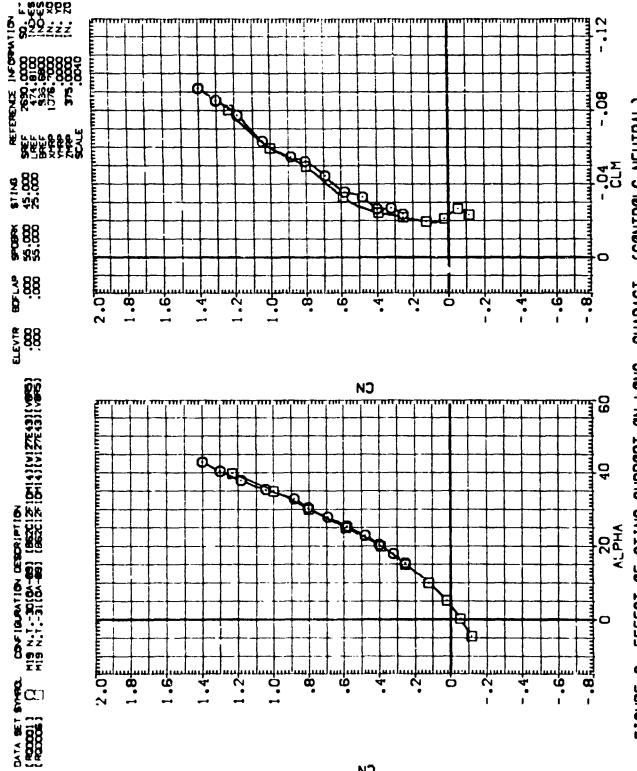


FIGURE

EFFECT OF WING AND BODY FLAP ON LONG. CHARACT. (45 DEG. STING) 19.80

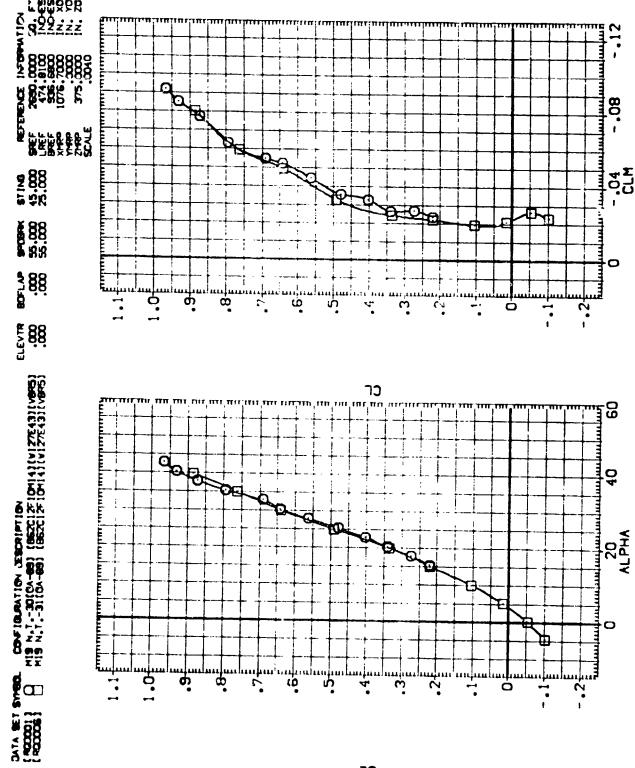
13

CADMACH



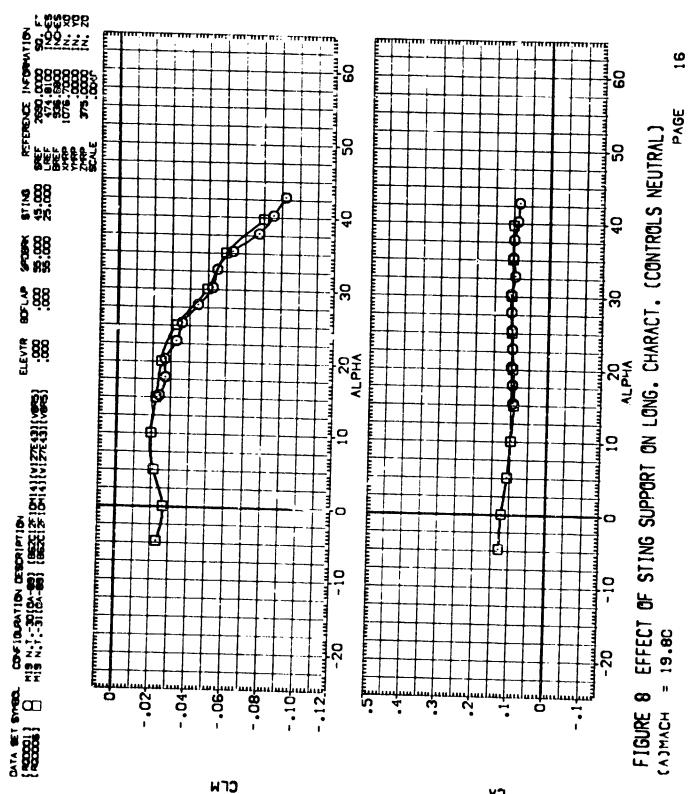
PAGE EFFECT OF STING SUPPORT ON LONG. CHARACT. (CONTROLS NEUTRAL) FIGURE 8

CN

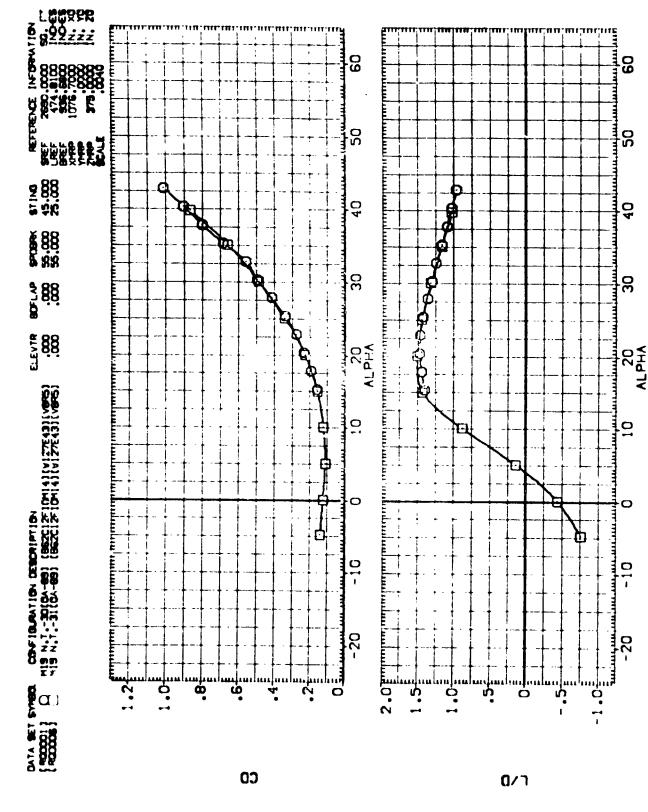


OF STING SUPPORT ON LONG. CHARACT. (CONTROLS NEUTRAL) EFFECT FIGURE 8

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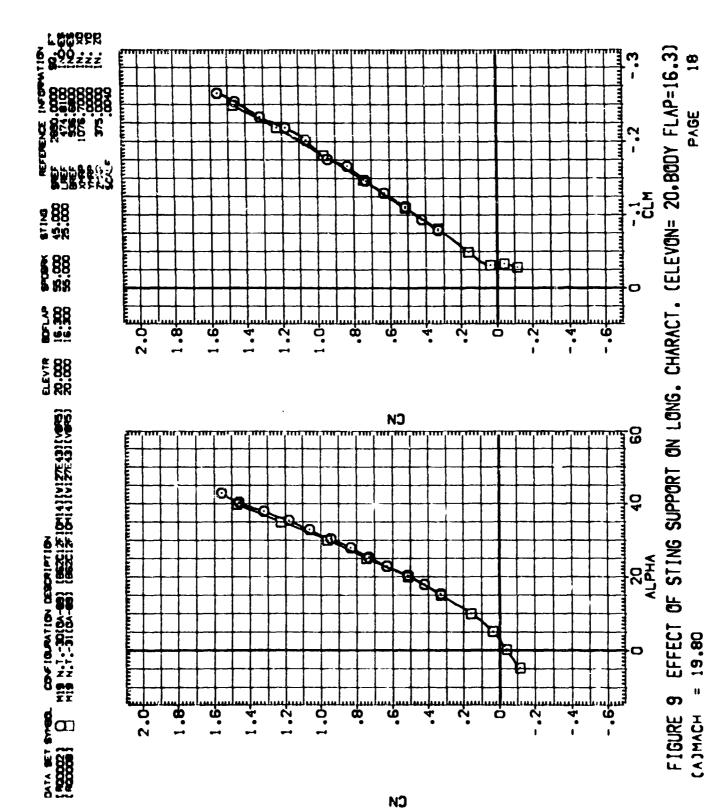


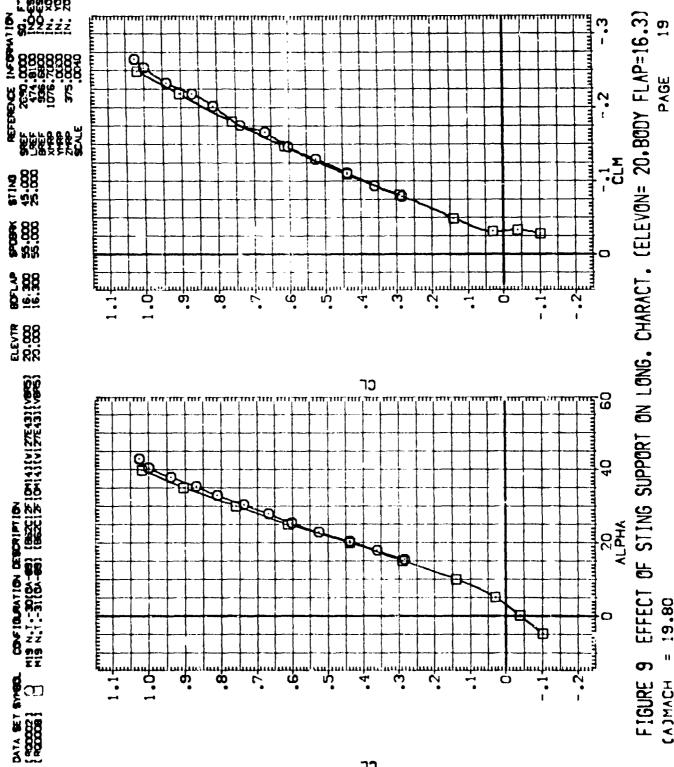
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EFFECT OF STING SUPPORT ON LONG. CHARACT. (CONTROLS NEUTRAL) FIGURE 8

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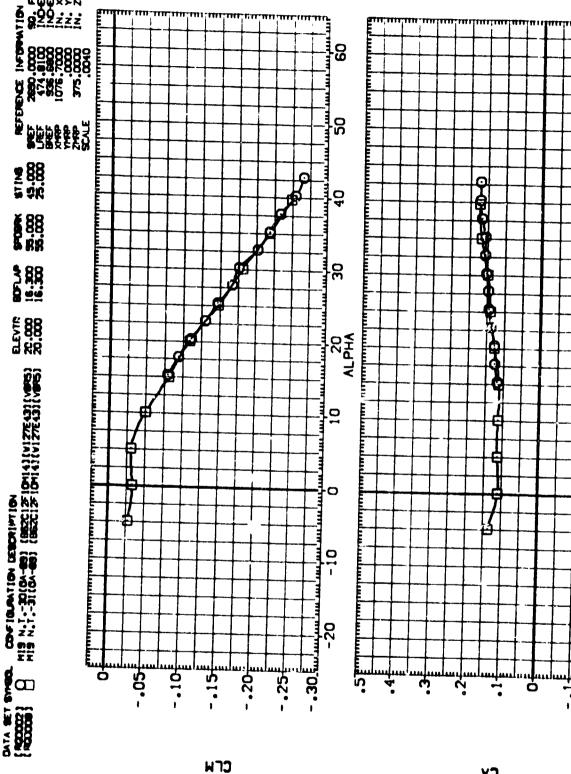




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19.80

(A)MACH



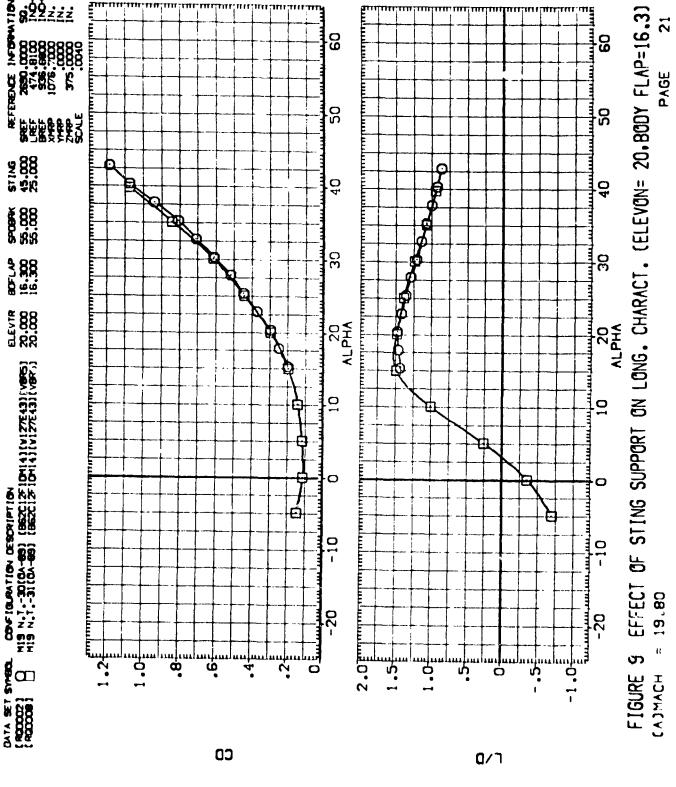
....

EFFECT OF STING SUPPORT ON LONG. CHARACT. (ELEVON= 20.8007 FLAP=16.3) တ FIGURE CA JMACH

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EFFECT OF STING SUPPORT ON LONG. CHARACT. (ELEVON= 20.800Y FLAP=16.3)

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APPENDIX
TABULATED SOURCE DATA

Tabulations of plotted data are available on request from Data Management Services.

(1660001) ( 18 MAR 75 MIS N.T.-30 (OA-44) (BG2C12F1DM14) (MIZ7E43) (VBRS)

ACCELENCE DATA

PARAMETRIC DATA

.69421 .69421 .67471 .67342 .67342 .67342 .67353 ELEVTR = BOFLAP = BALMCE = 1.39913 1.44259 1.46723 1.46723 1.46723 1.36223 1.2984 1.23820 1.15754 1.15754 1.15764 1.03872 .000 .000 88.000 48.000 .15732 .18932 .23126 .27571 .33675 .41332 .49627 .55761 BETA = -5.00/ 5.00 .40173 .47966 .56304 .64309 CL .21969 .27311 .33531 69043 . 79351 GRADIENT INTERVAL = CYN .07368 .07368 .07336 .07.57 .003514 .003643 .005643 .00643 .009641 .009883 CY -.00121 -.00234 -.00289 -.00644 -.01216 CLM - .02355 - .02722 - .02676 - .03294 - .03455 - .05236 - .05236 # 1076. PDG IN. XO # .0000 IN. YO # 375.000 IN. ZO 23/ D RWL = CA .09338 .09662 .09662 .109933 .10239 .10318 .09567 .09983 .09672 .09372 # # # # # # SREF = 2693,0990 84, FT LREF = 474,8199 INCHES BREF = 936,5899 INCHES 9CALE = ,0349 15.322 17.027 22.333 22.333 25.345 27.852 37.865 37.865 37.865 37.865 37.865 47.391 42.898 19.673 19.673 19.673 19.673 19.673 19.673 19.673 19.673

.67414 .67430 .67430

.97797. .97756. 1.91266

93123 .96758 (YYYY)

-.01765 -.02633 -.02633

-.04741 -.04562 -.09231

.872:J4

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<u>!</u> .

CARS SCINCE DATA

TA 100000 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	M19 N.T30 (OA-89) (862C12F1Delt4) NAT/E43) (V845) (R6DDD2) ( 18 MAR /5 )	PARAMÉTRIC DATA	1976. PDD IN. NO BETA 8 .000 ELEVTR 8 E0.000 ODDD IN. YO ALLRON 8 .000 BOFLAP 8 16.300 373.0000 IN. ZO SPORK 8 55.000 BALNCE 8 1.000 STIME 8 45.000	RM/L = .27 GRADIENT INTERVAL = -5.03/ 5.00	כרוא כל כלא ס" כם ר/ס א	_	09366 .10193 .00318 .35950 .24677 1.45682	.43659 .29663 1.47215	. 5248? . 36913 1.42191	.67341 .44379 1.35966	.66848 .51711 1.29272	.73619 .60804 1.21075	.00434 .01036 .70683 1.14324	.86881 .89951 1.97325	.93972 .94218 .99739	.17108 - ,25499 - ,01056 .00554 1,00055 1.07575 .93010 .71431	.17022662301094 .00553 1.02622 1.18548 .86566 .71286	
	M19 N.T		1 0007.8101 ** 1 0000. ** 1 0000. **	<b>3</b> ر. 0	•	·	·	•	•	_	•			_	•		•	
		REFERENCE DATA	474.8100 1NOHES 474.8100 1NOHES 936.6470 1NOHES 77140															
			2 . 3 . 3 . 3 . 3 . 3 . 3 . 3 . 3 . 3 .		NO W	19.62	19.67	19.67	£9.61	19.67	19.07	19.60	19.67	19.67	.0.63	19.67	19.87	

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CARS SOURCE DATA

74TE 19 MAG 75

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-35,000 -11,000 1,000 (REDOCIS) (18 MAR 75 ) MCP/L • 6448 • 64136 • 65136 • 65186 • 65186 • 65186 • 65186 .65458 .65458 .65566 ELEVTR = BOPLAP = BALNCE = PARAMETRIC DATA 1.20312 1.30912 1.36553 1.39314 1.28952 1.23849 1.17177 1.176+6 1.36679 54778 50.836. .000 .000. 85.000 67.00. .14011 .21084 .25517 .32671 .37516 .37516 .01592 .0771 .01490 .92240 DETA = ATLRON = SPORK = STING = GRADIENT INTERVAL # -5.007 5.00 CL. 17977 228734 226786 335549 44253 44253 35393 61341 .64162 .74731 .87491 .83693 HIS H.T.-. CO CA-88) (BG2CIEFISHIA) (MR7EAS) (VBRS) CYN .00152 .00103 .00171 .00267 .00267 .00344 .00342 .00312 28870. 78677. 11141 CY .00249 .00294 .00294 .00294 .00340 .00340 -.01302 -.01747 -.02159 -.02365 ~ - 07323 - 07364 - 07364 - 073613 - 07367 - 0737 - 07397 - 07397 - 07197 -.01414 CKICKY). ox .NI 0000. \*\*

Ox .NI 0000 . \*\* 20/ 0 Rev. = .00 / 00 .09 / 00 .09 / 00 .09 / 00 .09 / 00 .10 ğ 3 įį NUTRENCE DATA # 2000,0070 aq. FT # 474,8100 100468 # 938,6670 100468 E # 17140 ALMA 19.321 17.026 20.331 22.837 22.837 22.837 27.849 30.356 37.868 40.397 42.894 אכיורב . השמה . השמה .

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MIS N.T.-30 (CA-88) (BRECIEFIONIA) (AIR/EAS) (VORS)

PARAMETRIC DATA

UNBD204) ( 18 MAR 75 )

.000 11.000 GLEVTR . BOFLAP : BALNCE : .000. 10.001 10.001 10.001 41LRON = 8FORM = 8F:N6 = YMMP N .0000 IN. YO ZEND TH. YO ZEND TH. YO ZEND TH. YO ZEND TH. Z ACFERENCE DATA SALE = 2692,0000 86, FT LINES 1 LINES 1 SALE = 936,8800 INDRES 2 SCALE = 936,8800 INDRES 2 SCALE = 7,000

		ğ 5	30/ 0	RWL .	~	CA ADI ENT	INTOWN, 3	-8.93/	<b>9.</b> 00		
Ş	ALPRA					5	N.	ರ	8	3	MCP/L
8	15.320					9900.	78000	. 22 734	.16141	1.41183	OK 6.89
62.0	17.629					82/00.	00196	20254	. 19963	1.44430	. 66633
5	188.02					00800	00165	. 35532	.24476	1.49173	. 65833
000	22.035					01900	11300	4033E	.27765	1.45201	CACON.
8	25.319					.90461	50%CO	. 46714	. 33853	1.30224	
6	047					98900.	00347	. 54312	\$1001.	1.359.70	5. C.
6	3.5.339					96100.	00326	. 62 78	49496	1 . 200 52	C# 67 8 .
63	13.061					50237	00034	6479.	. 36985	1.18940	. 67844
19.600	35.369	-				-, 93569	00025	. 7521 7	.67333	1.11709	1673.
6.8.7	37.879					-, 'Y1669	12000-	. 04502	99000	1.05640	.67892
0.623	49.384					10010	. 120r'.	.66735	12110.	. 96 74 7	.67773
18.3	42.892					01116	.00264	.92428	. 99847	. 92569	. 67807
	GRADI ENT	ceree.	CYNYN.	cocre. c		COLORGE.	CCACCO.	cocco.	coxco.	cocce.	COCCCO.

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				HIS N.T33 (04-69) (862C12	) (04-89) (i	362C12 M14) (		( ( VBR 5)		(\$CCQ@M	1 10 MM 75	-
		REFERENCE DATA							Ş	PARAMETRIC DATA		
946 :	~	2647,0222 98. FT 474,8192 INCHES 936,6672 INCHES .mag		. 10 000. 14. . 1000. 14. . 175.000. 14.	9 2 2			BETA BALM	841MCE =	AND SPORK 1,979 STING	RK = 55.000 6 = 45.000	88
		-	9	32/ D RWL	.28	GADIENT	GRADIENT INTERVAL =	-5.007	8.93			
	<b>104</b>	ALPHA	ž	ð	CLM	Շ	ž	ሪ	9	?	XCP/L	
-	19.670	15. 300	58 176.	.03635	17 540.	01256	.97574	7 905G.	9880.	1.03369	. 43025	
-	19.070	17,894	.12527	.05452	.04642	1.5000.	08100	19201.	15060.	1.13739	. 5136	
-	19.870	20.376	.1 5024	99060	.05496	-,00357	56514·	.12332	19860.	1 25/31	. 51 534	
-	19.820	22.813	.19363	98086	62996.	00328	ויפַּבוּיִם.	. 1 5986	. 1216	1.30579	. 52472	
-	19.623	25.314	.23997	.05395	26990	-,00300	<b>SUSTICE</b> .	.19386	.15138	1.20063	24432	
_	19.87)	27.618	.27960	.05603	.06323	007000	£1814).	.22114	18004	1.22835	. 54:146	
-	19.6/73	39.321	.31657	.05394	96160.	01376	.171529	24634	81818	1.1921.1	. 54577	
-	19.87	32.85	36604	.03668	.1117	01952	12.5	19672	24 791	1.11230	10286.	
-	00.8161	35.333	.41349	10780.	.12458	02534	, 'y'9944	. V1433	.28367	1.76552	. 1986.	
_	19.67	37.836	48009	96860	13993	13586		343.0	91.194	60614.1	6,206.	
-	19.621	49.341	. 53776	28880	13504	04362	.01923	37100	. 39683	¥1046.	10000	
_	19.87	42.546	09860	02660.		864 PIC -	0.000	***************************************		1060	i or and	
		A OI ENT	COCCO.	CKENCO.	COLAG:	CANA	(AAAA)				racara.	
				H19 N.TB	) (68-40) [	MIS N.T31 (CM-89) (BG2C12F1ÜM14) (M12/E43) (VSRS)	1) (M2/E43)	(VSR 5)		(440736)	1 18 MM 75	^
		REFERENCE DATA	4						¥	PARAMETRIC DATA		
<b>*</b>		2690,9337 34. FT	H C SMOX	1976. AND IN. XO	o			96	8ET> =			8
LAEF		474.8173 INCHES	YMAP	OY .NI COCK".	۲٥ ٠			413	ATURON 3	WYY BOFLAP		66.
BREF		936,6823 INCHES	= c ¥	375. YYY) IN.	02 .			, P	"	55.1773 BALINCE	CE = 1.000	8
SCALE =		.9747						8	311NC #	666, 65		
			9 3	0/ 0 RN/L #		GRADIENT	GRADIENT INTERVAL 3	-5.93/	9.00			
	6 <b>1</b>	ALPHA	ć	ฮ	₩ U	Շ	ž	ઇ	9	\$	XCP/L	
-	19.67	-4.756	435	.12633	12327	\$ 1900.	.00035	10348	.13538	76436	. 57512	
-	19.837	690.	15550		02652	.03431	EMOCKO:	75367	.12:156	44521	. 46/83	
-	19.61	9.436	.02344	10901	02195	8080A)	38000	.01401	.1176	116%1.	(48/6.	
-	19.620	19.964		. 19835	71931	17800.	-, 30000 6	19481	.11838	CECSS.	. 43763	
_	19.877	15.774	.25131	.09122	12203	00352	.01230	.21894	.15344	1.42686	. 66226	
~	19.61	₹1,084	. 3922 /		-,12446	151179.	retico.	. 33502	.22386	1.93313	662/9.	
-	19.61	25.198	. 58943	1,17366	03272	(F)495	90,470,6	.49178	. 34117	1.43938	.67143	
-	19.6'7]	311.112	. 19642	. 11115	04947	9. SIV.	7 \$ 10.6	.64027	.48825	1.31135	.67279	
-	19.87)	35.125	1.077792	-	05975	6/3CT.	15144).	. 761 52	.65711	1.15669	76179	
-	19.87)	39.789	1.23361		-, 18,128	\$8166	60100	. 98442	.6657	1.02169	.6/318	
		GRADIENT	.71265		·ry16e	AE(Y4'	פועעעי.	18616.	1. 2030B	.16642	£ 5251'	

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/American	
ä	:

( 3/ bys		16.000
( 37 page 1/1 ) (1/00/08/R)	DATA	BLEVIR :
CCOBIN	PARAMETRIC DATA	
<u> </u>		BETA ATLACK BYOBEK B
MIS N.T31 (OA-85) (BERCIEFICHIA) (ALEFEAS) (VORS)		
MIS N. T 31 (OL-04)		MARP = 1076. 7000 IN. NO YMRP = CD20 IN. YO ZMRP = 373.0000 IN. 20
	REFERENCE DATA	945 + 2803.0000 54, F7 2866 + 1076.7000 1N, NO LREF + 474.8100 1NCMS year + .0000 1N, YO BREF + 930.8000 1NCMS 286F + 373.0000 1N, 20 SCALE + .0340
		CANE

SCALE :	G#UG*						-	. 94114	23.000	
		NA NO.	3/ 0 /	RWL = .21	CRADI ENT	INTERVAL .	-8.90/	8.8		
Ŏ	AL PAS	3	5	ş	Շ	ž	đ	8	9	7
	-4.799	11106	C4851.	08662	score.	19100	1000		- 7475	7.15
6.623	<b>C</b> 60.	C. 080	.11445	02730	.00448	**000	090e0	24.1	- 4440	****
19.000	150.8	.92174	.1000	02243	7 9000	e0100.	.1210.	2001	\$2011	2000
6.6	19.068	.12738	S 880.	02678	.00161	- (MDE	10		10500	
5	15.975	90673.	.10322	9429 £	78000.	07022	.23075	13121	1.30449	27.6
C	<b>30</b> 0.0	13927	.11252	06295	.00186	00046	29265	26141	*****	7
6.633	25.193	. 66593	.11965	08291	96800.	66000-	57220	100	1.41519	
CC9.6	20.08	.91594	.13237	1159	01800.	0.000	1192/	27.46	67596	
0.800	35.126	1.11923	0.5821.	14766	.00439	1 500CC	.03420	74369	40141	
0.600	39.741	1.36296	.13665	17384	.03625	00061	45096	09926	96 8 96	7000
	GRADIENT	.01256	00228	020310	Secrio.	077344	CKOID.	00412	.08311	4.020.

VOR 3
A27E45)
FIDM4) 0
( <b>Ber</b> C15
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N. T.
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( 18 AM 81 ) (9CCDBA)

PARANETRIC DATA	### 1000 BLEVTR # #0.000  ATLRON # .000 BOFLAF # 16.300  \$PORM # \$5.000 BALNCE # 1.000  \$TING # 25.000
AEFEAENCE DATA	MARY 3 2690.0000 34. FT DOMP 3 1076.7000 IN. NO UNITS 3 474.8190 INCHES YHMP 3 .0000 IN. YO BREE 3 936.6600 INCHES ZHRP 3 375.0000 IN. ZO SCALE 3 .0040

19-873   1-4-874  11425   -13821  02735  03164  10226   -14547  73221   -56191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156191   -156192				ì		MANUEL INTERVAL S	-3.02	8.6		
-4.67411425 .136210273500206 .0016410226 .145477022170221 .1032470224 .10324 .1032470224 .10332 .10324 .10324 .10324 .10324 .10324 .10324 .10324 .10332 .10333 .10332 .10333 .10332 .	Į.		ð	5	U.	ž	d	8	ç	7
5.05903994	19.873		11429	13621	92735	44100	- 10356			
\$.059 .03904 .11249035020313402973 .1052433409 .1052433409 .105342570325703550955			2000	20011	0.880		-1066			196.
10.097   11284   11284   -0.0092   .00104   .00023   .02975   .11573   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25703   .25704   .2						96100	03948	4.50C.	35699	K 040 .
10.067 .10100 .112430402100224 .00133 .13974 .13997 1.00332	77.		.039 <b>64</b>	.11266	03092	.00083	27850.	.11579	25703	.9350
### ### ### ### ### ### ### ### ### ##	3.63		.16184	.11243	04921	.00133	.13974	. 139.0°	1.90532	7610
#50.De7	6.61		.32897	.11152	19090'-	90000	.28864	19328	1.40363	
25.101 .74399 .1402314795 .0039300310 .61424 .44260 1.36781 37.113 .96576 .1472218090 .00326 .007029 .75924 .61053 1.24367 35.127 1.22299 .1673221865 .00734 .90414 .84260 1.07597 39.842 1.47180 .1727424907 .0749 .00734 .90714 .84281 1.07597 6862ENT .015270733207736 .0127407779 .08688	CC0.61		. 51217	01921.	19666	#1CCC	.4377	75.75	1.46.70	
30.113 .96308 .1472218090 .00326 .00029 .5924 .61033 1.24357 35.127 1.22299 .1673221865 .00302 .00034 .90414 .84031 1.07397 39.842 1.47180 .1727424907 .00479 .00063 1.01925 1.07344 .94775 6845ENT .015270031200117007132007706 .0127400779	000.61		. 74399	.14023	14795	01000	61424	44200		
35.127 1.22299 .1673221865 .00302 .00054 .90414 .84031 1.07597 39.842 1.47180 .1727424907 .00479 .00063 1.01925 1.07544 .94.75 GRADIENT .01520003170031200716 .0127400779	0.600		96308	.14722	18090	9000	15924	15019	. 24447	
39.842 1.47100 .1727424907 .00479 .00083 1.01925 1.07544 .94779 GRADIENT .0152000312003120031200719 .00688	0.00		1.22299	507.01.	21865	.00034	41404	.64031	1.07597	
01580 00532 00117 00705 00706 01580 00688			1.47100	.1771.	24907	.00063	1 01925	1.07944	94/79	7122
		GACIENT	101 SEC.	00532	00117	0000	17210.	*. On 719	1000G.	

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ï	RUGRENCE DATA	17.						Ž	PARAMETRIC DATA	17	
2699.5333 84. 474.8173 140	693.5525 84. FT 474.8175 14CMES 838.6472 14CMES		OX -N1 0007 -8101 OY -N1 0000 - OX -N1 0000 -878	. 1723 14. XO .0733 14. YO			BETA ATLACE SPORK		4 (20)	ELEVIA : BOPLAP : BALNCE :	-40.023 -11.70 -13.000
SCALE #	0900			<b>:</b>			STING				
		9	2/ 0	RWL = .21	GADIENT	GRADIENT INTERVAL :	-5.00/	<b>5</b> .00			
ŏ	ALPHA	3	đ	<b>*</b>	Շ	ž	ಕ	8	3	X	XCP/L
19.000	-4.738	15737	.15322	18 100	99800.	99000	14362	.16572	8678		70889.
19.67	.048	615/6	.12053	71395	. 92644	-,00069	97429	15047	61 666		. 50061
19.600	5.055	.00109	.11.471	-,00004	.00284	007132	50,600	.11436	0789	3.36431	123
19.822	10.063	.19344	15/21.	00524	.003 52	151470.	.06326	.12271	.67864	_	. 66963
19.870	15.974	57.865.	.10373	00423	. 93249	10000	.20353	.16224	1.25453		. 64648
19.670	20.086	.39732	.19863	01570.	.93361	077.49	, 33565	.23847	1.47832		.64898
CT-0.61	25.190	. 57130	9/011.	0.000	06400	00029	14.0037	.34264	1.372.1		.84556
19.800	39.116	19897.	.11376	.00603	.00454	.00734	2/629	. 49678	1.26/38		.64 /21
19.633	35.132	1.99857	.1129	18 81Y!	40200	\$1100.	. 75993	.67264	1.12976		.64697
19.870	39.793	1.15953	10801	C5150.	-,77496	,00433	. 921 79	. 02513	.99598		.64328
-	277	,	4								

REFERENCE DATA

(AQD233) (18 HAR 75 )

M19 N.T.-30 (OA-89) (BEZCIZFIOMIA) (WIZ7E43) (VOR5)

PARAMETRIC DATA

86. 88. 88.

ELEVTR = BOPLAP = BALNCE =

000. 000. 000.88

BETA E ATLRON B SPOBRK B STING B

94E = 2693,0003 54. FT XHRP = 1076,0003 IN. XO LAEF = 444,8107 INCHES YHRP = .0003 IN. YO BAEF = 936,6603 INCHES ZHRP = 375,0993 IN. ZO 9CALE = .0043

GRADIENT INTERVAL # -5.007 5.193 92. RUM NO. 237 S RN/L =

Q (P9F)	40.66197	40, 50217	003 14 104	41.61838	40,41,500	40).32764	47.29878	47.67649	40.38595	39.93563	39.92107	40.31331	conon.
Z	0.867.5.	06875.	.2 /82/	.26267	56132	.26.179	.26083	.26304	.26116	.25925	.25916	.26)69	ULAKA.
<b>BETA</b>	022386	7,6000	-, ON) 59	-, 99059	-,32069	02039	-,02059	02039	02333	-, יוייו 25	פועיעי.	5804%	CKKKK).
ALPHA	15.322	17.927	20,333	22.638	25.345	27.032	30.380	32.865	35.375	37.883	47.391	45.898	GRADIENT
ŏ ¥	19.620	19.622	19.633	19.800	000,61	19.670	19.600	19,820	19.87	19.623	19.670	19.82	-

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	PARAMETRIC DATA	#ETA # .000 ELEVIR # E0.000 Allaca # .000 Boflar # 16.900 \$FORK # \$9.000 Balace # 1.000 \$7186 # 45.000
MIS N.T35 (OA-89) (SECTIFFICHIA) (MIZ/EAS! (YEAS)		MA. FT XMMP = 1076.70XD IN. KO INCHES YMMP = .0XXD IN. YO INCHES ZMMP = 375.00XD IN. ZO
	4	* * * *
	NEFENENCE DATA	1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	10.0	SACT : 2440,0077 LAST : 4/4.8173 BACT : 938.6609 SCALE : .0004
		A A A A X

8.38														
GRADIENT INTERVAL5.00/	. (PSF)	40.31331	19042.04	40.18256	40.16004	40.06634	40.90217	60.43838	£0.23.04	40.15351	€ 1922 C#	40.28428	40.29878	COCATO
INTORVAL	ž	.2664	.zes.	20002	.26792	.26724	. 2 M15	.2000	282.	28782	.26. 1	.26669	£ 992.	CHARLE
GRADIEM	¥£3	90110	-,0009	16000	7,0000	90082	000 74	00062	00051	DO0144	-,00035	00026	(17)722	MAAD.
	AL THA	15.323	17.020	20.334	22.840	25.346	27.052	30.359	32.065	35.371	37,980	40.300	42.094	GADIENT
# 1/WE 0 /#	¥0	19.00	19.600	19.600	19.600	19.600				19.600	19.600	19.600	19.833	3
2 · O · S														

CASS SOURCE DATA

DATE 19 MAR 75

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( 6/ Bres 01 ) (ECCOBV) PARAMETRIC DATA MIS N.T.-30 [CA-89] (862C12F15M14) (MIZ7E45) (VBR5) REFERENCE DATA .003 ELEVTR s -35.000 .007 BOFLAP s -11.793 95.073 BALNCE s 1.073 45.073 META ... AILRON ... SPORK ... STING ... 94EF = 2697,0273 84, FT MARP = 1076,7020 IN. MO LREF = 444,8197 INCHES YMP = .0720 IN. YO BREF = 916,6673 INCHES ZMP = 375,1523 IN. ZO 964E = .7347

GRADIENT INTERVAL = -5.09/ 5.09 .27 RN/L **50 / 0**2 . .

ð	ALPHA	<b>8</b> C7 A	2	0 (FSF)
19.620	15.321	-,00063	.26792	40.16834
000.61	17.626	**,00055	26/92	40.16804
06.91	20.331	00035	.26821	40.21162
19.6/3	22.537	-,00062	.26847	40,24067
19.670	25.343	-,00034	.26995	40.47311
19.6/20	27.849	00033	.2 7315	11513.04
19.873	37.356	(22)348	.2 7003	40.48764
19.833	32.864	15000-	.e 2003	49.49764
19.600	35.372	-,00049	.26986	413,45458
000.61	37,888	-,077028	.26966	47.42953
19.800	40.387	00033	.26995	41,47311
19.837	45.894	02038	\$6692.	40.47311
	GRADIENT	(WYY)	CYCYC.	CKY-CK-

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( 10 MAR 75 )

PARAMETRIC DATA

.000. 007.11-0001 BLEVIA :

BALNCE . .070 10.020 55.020 45.020 BETA = AILRON = SPOBRK = STING =

\* 1976, 7930 IN. NO \* OCYT IN. YO \* \$75,000 IN. 20

4 ¥ ¥

SALE = 2691.7725 80. FT LREF = 4/4.8127 INCHES : BALE = 936.6872 INCHES : SCALE = .17147

RUTERCICE CONTA

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GRADIENT INTERVAL = -5.00/ 5.00 ~ # J. 0 /% 9 5

a (PSF) 40, 70555 40, 61636 40, 51669 40, 47311 40.13696 40.77619 40.26973 39.96465 40.56028 45.45858 40.96704 .26606 .27155 28752. .26491 .26685 .26618 .26693 ALPHA 15.320 17.023 27.351 22.035 22.035 27.347 37.355 37.036 47.304 42.005 4.00

Maintain	n n n n	4			M9 N.1	-30 (04-89)			1 (VOR.5)		(A&0)		
Second State   Seco	n n n n	•											
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	H H B H		1							_	PANAMETR !	C DATA	
March   All Park   A					10/6. 750 .000 375.000				1 ° 6 ° 7 ° 1 ° 1 ° 1 ° 1 ° 1 ° 1 ° 1 ° 1 ° 1	H	900°.		\$\$.000 <b>\$\$.</b> 000
15.072   15.102   15.103   1		-	ال ال	.,				I INTERVAL	-9.00/	8.93			
19.070   19.300  07020   27.8170   0.44446   0.44446   0.44446   19.070   19.07033   27.8170   0.44446   0.44446   0.44446   0.44446   19.070   27.818  07023   27.818   0.93289   0.93289   19.070   27.818  07023   27.818   0.93289   0.93289   19.070   27.818  07023   27.818   0.93289   0.93289   19.070   27.818   0.90238   27.818   0.90238   0.93289   19.070   27.818   0.90238   27.818   0.90238   0.93289   19.070   27.818   0.93289   0.93289   19.070   27.818   0.90238   27.818   0.90238   0.93289   19.070   27.818   0.90238					5	AL PHA	BETA	ž	Q (PSF)				
19-80   17-804   -1000   -10					19.62	15.300	02000'-	S 278.5	49.48764				
19-870   22-314   -1.07024   -1.2819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.1819   -0.19379   -0.					19.60	17.894	00035	.27845	40,44496				
19-670 22-361007072828169 40-38799 19-670 22-361007072828169 40-38799 19-670 22-3-31407072228169 40-38799 19-670 32-28407072228169 40-38799 19-670 32-28407072328169 40-38799 19-670 32-28407072328169 40-38799 19-670 32-28407072328169 40-38799 19-670 32-28407072328169 40-38199 19-670 4-3211 4-3210 40-38199 19-670 19-67					19.800	20.306	93037	.28190	40.95251				
19-670 27-814 -(-7072) 2-28160 40.92399 19-670 37-814 -(-7072) 2-28160 40.92391 19-670 37-814 (-7072) 2-28160 40.92391 19-670 37-814 (-7072) 2-28190 40.92391 19-670 37-814 (-7072) 2-7891 40.97400 19-670 37-814 (-7072) 2-7891 40.97401 19-670 37-814 (-7072) 2-7891 40.97401 19-670 38-71 38-					19.600	22.010	•00029	.20163	45.93799				
19-670   27-818   -1-0002   -27-818   -27-930   -27-849   -27-930   -27-849   -27-930   -27-849   -27-930   -27-949   -27-930   -27-949   -27-930   -27-949   -27-930   -27-949   -27-930   -27-949   -27-930   -27-93					19.600	25.314	92023	.28185	40.93799				
19-870   37-321   37-369   3					19.600	27.818	00002	.28195	40.95251				
19-800   37-375   -100024   -10-3111   -10-305   -10-3111   -10-305   -10-3111   -10-305   -10-3111   -10-305   -10-3111   -10-305   -10-3111   -10-305					19,600	30,321	\$0000	.e 78.35	49.57480				
19-803   19-23   19-					19.620	32.826	ercee.	.27890	40.51669				
19-870   31-326					19.800	15.37.	\$11.00	.27860	40.47311				
19.670   40.341  17736  27830   40.42933   40.4					19.800	37.036	00024	.27860	40.47311				
19.670   42.646  107030   .27703					19.800	49.341	07036	.27830	40.42953				
M19 M.T31 (OA-89) (B62C12F1OM14) (M12/E43) (V943)					19.600	42.846	-,00092	.2786)	40.47311				
### A PANETRIC DATA  ##################################						GADIENT	cccco.	00000	00000				
######################################					M 9 N.	31 (04-89)	(862C12F10M1	4) (M27E43	3; (v845)		(44007		
######################################													
## 44.0100 30. F7		ACFERENCE ON	<b>₹</b>							_	PARAMETR1	C DATA	
# 474-8190 INCHES YIMP #07930 IN. YO SPORKK #0950 BALKE #0950 INCHES 2PMP &373.07020 IN. ZO SPORKK #995.0920 BALKE #995.0920 INCHES 2PMP &973.07020 IN. ZO SPORKK #995.0920 BALKE #995.0920 INCHES 2PMP &995.0920 INCHES 2P	*		d Unix	H	1976. 7930	IN. KO			9ET/		CCC		000
# 936900 INCHES ZNRP h 3/3.0000 IN. 20 SPORRK a 55.000 BALNCE # 1 STING # 25.000 BALNCE # 2 STING	- 1367	474.8100 INCHES	Y RE		coo.	TN. YO			714	7	S.		6
#	the CF =	934, 6623 INCHES	214	A	375.9220	78. 70			d		000		
D/ (1)         RAVL =         .21         GRADIENT INTERVAL =         -5.007           IMOH         ALFMA         BETA         RN         Q (P3F)           19-800         -4.756        00079         .20451         40.63159           19-800         -0.756        07036         .21000         40.92147           19-800         -0.0764        07037         .20639         40.31265           19-800         15.074        07037         .20639         40.7473           19-800         25.094        07037         .20699         40.71633           19-800         25.094        07034         .20699         40.71633           19-800         35.122        07034         .20695         40.71635           19-800         35.122        07034         .20695         40.61765           19-800         35.122        07034         .20635         40.61765           19-800         35.126        07034         .20635         40.61765	-	Carco.	<u>:</u>						911		25.000		
ALPHA BETA RN -4,756 -,020.79 ,20351 ,049 -,020.66 ,21720 5,036 -,020.54 ,20618 10,064 -,020.57 ,20618 20,064 -,020.37 ,20619 20,064 -,020.37 ,20619 25,096 -,020.49 ,20619 35,122 -,720.54 ,20615		•	N					INTERVAL	-5.99/	5.00			
-4.75600079 .20481 -0.4900056 .21020 -0.4005400037 .20648 -0.40037 .20648 -0.40037 .20648 -0.40037 .20688 -0.40037 .20688 -0.40037 .20688 -0.40037 .20688 -0.40037 .20688 -0.40037 .20688					ŏ <b>≸</b>	4	<b>8</b> ETA	Z	Q (PEF)				
10.49020.66 .210.25 10.054020.34 .20.648 15.074020.37 .20.648 25.094020.49 .20.696 25.096020.49 .20.696 35.122020.49 .20.696 35.125020.47 .20.635					19.650	-4.756	e/ 000	. 20851	40.63155				
5.03600034 .2068 10.06400037 .20673 15.07400037 .20686 25.09600037 .20686 90.11200034 .20635 35.12500044 .20635					19.800	940.	00066	66,15	45.92147				
15.07400037 .20673 15.07400037 .20686 25.09600037 .20686 90.11200034 .20635 35.12500044 .20635					19.620	9.036	90034	.20688	40.31265				
15.07479723 .2-1999 23.09409337 .20989 25.09609349 .20996 90.11219959 .20948 35.12509347 .20935					19.67	10.064	1,000.	.29673	40.28366				
23,084 -,00037 ;20888 25,096 -,00049 ;20896 30,112 -,10055 ;20844 35,125 -,10054 ;20835 39,789 -,00047 ;20821					19.827	15.074	47123	.2.1999	40.73473				
25.09602049 .20896 30.11207035 .20844 35.12502034 .20835 39.76902047 .20821					19.630	23.084	-,00037	.20688	40.70403				
35.112 -,177355 ,270844 35.125 -,177354 ,230835 39,769 -,172147 ,23021					19.800	25.098	00749	.20096	40.71653				
35.125 (22)354 .23635 39.789 (22)47 .23621					19.823	30.112		.27844	40.61 706				
39,789 00047					19.600	35,125	72154	.27,835	43.60256				
					19.600	39.789	00047	.20021	40.57357				

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## M19 N.T.-31 (OA-89) (B62C12F1DH14) (M127E43) (V8R5)

(AB0307) ( 18 MAR 79 )	PARAMETRIC DATA	.000 ELEVTR = 10.000 .000 BORLAP = 15.900 55.000 B-LNCE = 1.000 25.000
MIS H.T31 (OA-89) (B62C12F10M14) (M127E43) (VOR5)		BETA BALRON BALRON BALRON BALRON BALRON BALRON BALRON BALRON BALLON BALL
M19 H.T31 (OA-89)	ACFERENCE DATA	ME = 2697.9701 24, 71 204P = 10/6,7930 IN, KO LREF = 4/4,8191 INCHES YNRP = .9000 IN, YO BREF = 936,6691 INCHES ZNRP = 378,9000 IN, ZO SCALE = .9349

8.8												
GRADIENT INTERVAL # -5.00/ 5.00	(P3F)	40.60256	40.54436	40.48660	40.45761	49.42861	40.34164	40.34164	40.37063	40.77651	40.74752	70210
INTERVAL	ž	98 <b>9</b> C2.	70902	77702.	32705.	7.5705.	2070S.	507.05.	71102.	926CZ.	11602.	90000-
CA ADI ENT	BETA	00042	00033	-, 52534	61000	ccccc.	70000*-	62000:-	18000	00032	00090	50000
RWL = .21	AL PHA	-4.755	060.	250.5	10.069	15.975	20.086	25.100	390.08	35.126	39.741	RADIENT
S/ O RIVL	104	19.600	19.623	19.62	19.600	19.600	19.670	19.000		19.600	19.000	J
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## M19 N.T.-31 (OA-89) (862C12F1DM14) (M127E43) (V8R5)

REFERENCE DATA

(AgDDD8; ( 18 MAR 75 )

	20.000 16.300 1.000
DATA	BLEVTR =
PARAMETRIC DATA	.000. .000. 8\$.000
	BETA # ATLRON # SPORK # STING #
	2 2 2
	ž ž ž
	200 H 2076, 7000 IN. XO YMEP = .0000 IN. YO ZMEP = 375,0000 IN. ZO
< −	ă ă ă
ERENCE DATA	M. F. INDES INDES
900	MEG : 8493,0000 URF : 4/4,6100 MRG : 936,6600 SCALE : ,0040
	* * * *
	SCALE .

8.8												
GRADIENT INTERVAL = -5.00/ 5.00	@ (P3F)	40.19668	40.34164	40.15319	40.03723	39.99374	39.96475	39.95025	77906.66	39.92126	39.90677	.02943
INTERVAL	ž	51805.	99602	.23495	.23439	9C4C2.	86802.	.20386	-20364	.20371	.27364	\$1000.
PRADIEM	BETA	92000:-		7 1000	11000	11000-	7,1000,-	99934	97035	92037	cecro	succu.
<b>X</b>	ALPHA	-4.874	550.	5.359	19,047	14.977	33.C3	25.101	30.113	35.127	39.842	RADIENT
8/ D RWL :	<b>10</b>	19.600	19.000	19.90	19.600	19.920	19.620	19.00	19.875	19.820	19.67	3
RUN NO.												

**y** }

( 18 MAR /5 )	
MIS N.T31 (OA-88) (BG2C12F1DM14) (MIR7E43) (VORS)	

PARAMETRIC DATA	* .000 ELEVTR * -40.000 N * .000 BOFLAF * -11.700 K * 55.000 BALNCE * 1.000	8												
	BETA :	GRADIENT INTERVAL = -5.03/ 5.00	6 (PSF)	¥	Ĭ	Ī	•	•	•		•	Ī	•	
		GRADIENT INTER	BETA	ŝ		97021 .20695			_			001521007.		11000:- 10000:
	1976. PDD 1N. XO .0720 1N. YO 375.070 1N. ZO	RWL = .21	₹#¥			5.755				25.100	30.116	35.132	39.793	GRADIENT
		0 /2	W ON	19.600	19.620	19.80	19.000	19.82	19.600	19.600	19.600	19.80/	19.800	
NE CADACE DATA	9467 : 2040,0000 30, FT 2040 LAGY : 474,8100 INCHES 1149 BARE : 936,6600 INCHES 2149 SCALE : ,7040	- A												
	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2													